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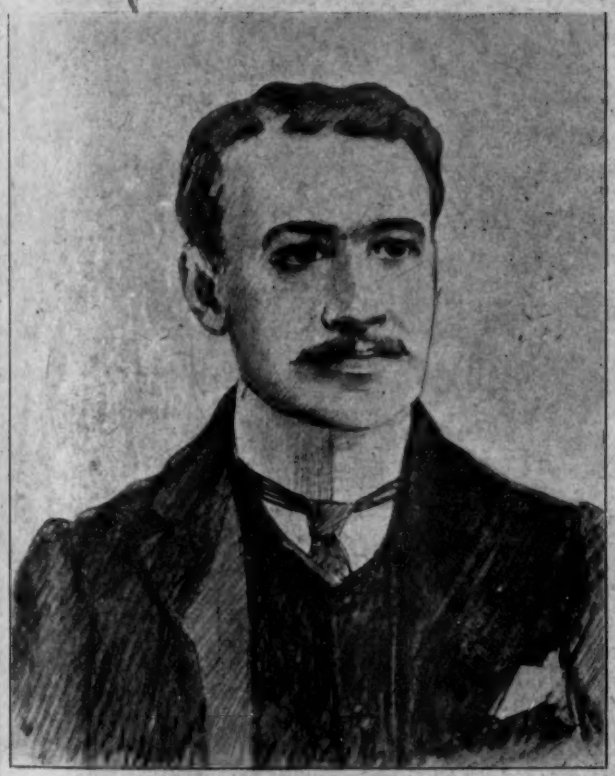

Mr. J. B. BURKE

(See "The Origin of Life," p. 62.)

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EDUCATION IN PARLIAMENT.

IT sticks in the rut, the Scottish Education Bill, and (as in the fable) the waggoner—Mr. Scott Dickson—may call on Hercules and Mercury, but the wheels will not budge. Deferred till "after Whitsuntide," was reported here last month. Whitsuntide is past, and still the Bill sticks in the rut—the Parliamentary rut, a trench of powdered and glutinous macadam.

Other vehicles plough the road in Parliament—vehicles of the most miscellaneous assortment and nondescript character. Buggies, gigs, chariots, shandrydans, motors, broughams, jaunting-cars, and what not. Parliament has considered the Risk of Communication of Glanders to Human Beings, the Grazing Lands on Lord Trimlestoun's Farm, County Roscommon, the Case of William Simmonds, late Royal Field Artillery, Motor-car Horns and Sunday Services, the Scarcity of Cottages at Thakeham, Sussex, the Memorial of Officers of the Dublin and Queenstown Travelling Post Office, the Site for the Statue of the late Duke of Cambridge, a Dying Voter at Fintona, Sale of Calves inoculated for Lymph for Food, the Visit of a Salvation Army Officer to John Foster under Sentence of Death, the Livid Complexion of Big Ben, Coccidesis in Rabbits, Sentence of Imprisonment on the Chavikedas of Mahabis, Macedonian Finance, and the Postal Deliveries in the Townships of Mullinarat, Kilmacorr, and Mooncoin. Parliament has also considered a thousand other topics, of all sorts and sizes, except the final sort and size of the Scottish Education Bill.

Among the thousand there have been a few which dealt, more or less directly, with Education. Thus Sir John Gorst has been anxious, and Sir William Anson reassuring, about the Alleged Caning of Children in Preston Schools for not paying Fees. The Education of Children on Indian tea-plantations has not altogether been lost sight of. Errors in the accounts of the Surrey Education Committee have come under question. Liability of Local Authorities to pay Rents for Teachers' Houses has awakened some interest. It has been made known that vagaries have occurred in connection with the Conscience Clause in a part of Worcestershire. Allen's School, County Armagh, has awakened the echoes of the House—echo answering in an Irish brogue. In a Doric accent the House has heard of the Selection of Pupils for Enrolment in Supplementary Courses in Scotland. Lament has been heard that the Workmistresses in Irish National Schools have no pension provision for retirement. In the accents of Fluellen the relations between the Board of Education and the Court of the University of Wales have come under review. Sir Elliott Lees, Bart., in a graceful and Turveydrop-deportment-like way, has pleaded for the incorporation of Rifle shooting as part of the curriculum of Public Elementary Schools. In Gaelic (almost) there has been mention of the question of building Irish Colleges of Science by Irish architects and Irish workmen of Irish materials. Oh, the ventilation of the subject of Education in Parliament has not been precisely null and void.

In fact, the English Code has been laid on the table. Laid on the table, but not discussed. Nothing—and yet everything—seems to have been discussed. Mr. Yoxall has introduced and obtained the first reading for a Bill which is cunningly calculated to make it not worth the while to employ any half-timers in Lancashire mills. Education as a topic has cropped up in the queerest of places, as in discussion on the British Mercantile Marine, and on the Speed of Motor-cars; the horses in the streets have now been educated not to be shy of motor-cars, it was said. But the one big educational dish of the session, the Scottish Education Bill, has remained on the shelf. Nobody has reached it down for long. The Scottish Minister has not. Scottish members have not pressed him to do it, and there is no teacher-member from Scotland to "make things hum."

Humdrum, therefore, this last month, the topic of Education in Parliament. The reason why Scottish members have left it alone appears to be that they are wildly interested in the Bill to settle the affairs of the

United Frees and the Wee Frees, who together are the Disunited Frees. A Bill to that effect has been introduced, and contains a clause quite foreign to the purpose. It is a clause to remove a shackle from the Scottish Established Church, henceforth to be known as the "Be Frees." The Scots, therefore, and a few Southrons, have indulged in an orgy of theological polemics. No adequate time for an Education Bill when theology is to the fore.

Whitsuntide intervened awkwardly for the prospects of the Scottish Education Bill. So did Mr. Speaker. Mr. Speaker Gully informed the House that, worn out with ten sessions, in working half the time of each session, he proposed to retire, on the usual title and £4000 per year. The House lamented but concurred. Many hours were spent in discussing Mr. Speaker Gully's achievements and Mr. Speaker Lowther's merits, both of which are great. Meantime the Scottish Education Bill got pushed further back on the shelf. It was in a dark corner of the pantry; it was a funeral bake-meat, fit for use at the impending burial of the subject again. It began to be odorous, as of a strong cheese. Meanwhile Mr. Balfour announced (at the beginning of July) that he had "ten days left" for legislation, and only by the use of the closure in compartments can he hope to pass even the Aliens Bill.

Time has been wasted on the Unemployed Bill, on the first and second readings of a measure which is not to be passed. Time has been wasted on the Aliens Bill, on the first and second readings and the Committee stage of a measure which nobody expects to be effective. Not only Education in Parliament has suffered from this waste of time. Many another matter has stood still; of late years the Parliamentary machine has gone more and more *rallentando;* and early in July the Prime Minister gave the House of Commons to understand that the Parliamentary machine was breaking down.

It is not, perhaps, a matter for unadulterated lament that Education in Parliament has gone slow this year. If the Scottish Education Bill is lost after all, it will be a great pity, no doubt, but, otherwise, that Parliament should not be too much or too often bothered with Education is all to the good. For nearly ten years Education has been a standing chief dish with the House of Commons, and to the average member of Parliament educational affairs had become rather a bore. "Why shouldn't we have holiday from school?" one of them said, not unwittily. They are having the holiday this year. But the Scottish Education Bill has been lifted down from the shelf and taken out for a Friday stroll through the lobbies, and there is a chance—just a tiny, almost invisibly infinitesimal chance—that it may stroll as far as a third reading. But then, what about the House of Lords? Education "tires" the Peers more easily than it does the Commons. Looking ahead and writing ahead, one cannot feel hopeful of a Scottish Education Act this session. A new lion is in the path—the Redistribution proposals. Very unlikely indeed that there will be a redistribution of educational areas in Scotland this year.

BY MANY HANDS.

"Quot homines, tot sententiæ."

N.U.T. NOTES.

ONE evening during Conference week, in the smoking-room of the Queen's Hotel, Llandudno, sat side by side seven gentlemen, all ex-Presidents of the Union. Six of them wore on the lapel of the coat the beautiful badge presented to each retiring President at the close of his term of office. The seventh—the *doyen* of the party—had no decoration, having passed through the chair in the early "eighties," when such things were unknown. The incongruity was at once observed and commented on by "a chiel amang us taking notes," Mr. George Fenton—always a welcome visitor this side the Border—and the hint was quickly taken up by Mr. Blackburn, who, at the first meeting of the new Executive, moved that the deficiency be supplied forthwith. His resolution was heartily and unanimously adopted; and when the decoration was ready, it fell to Mr. Tom John's happy lot to present the same to Mr. G. J. Rankilor, the genial veteran from the city of Birmingham. A somewhat lengthy and extended experience usually makes me discount by perhaps fifty per cent. the encomiums I hear pronounced at Russell Square. But, for once, I am fain to confess that every word of Mr. John's panegyric was thoroughly deserved. Mr. Rankilor reappeared at the Executive Board at a time of storm and stress, when it almost seemed as if the *soi-disant* "leaders" of the then "voluntary" school teachers desired and courted a rupture in the Union itself. No good purpose would be served by dwelling on a variety of unpleasant incidents, and I only refer to them thus vaguely in order to pay my humble tribute to Mr. Rankilor's genius and moderating influence, which effectually removed every cause of strife. Naturally, he received an ovation on rising to respond, and I was specially interested in his description of the three clearly defined stages through which the Union has passed: "First there was the period when it met with the indifference of the press and the public. Later on this indifference was changed to active opposition, a turn-about which Mr. Rankilor hailed with delight, for he knew that it was an unmistakable indication that the Union was rapidly gaining in strength. The third and present stage was its universal recognition as a power for good in educational affairs." That Mr. Rankilor may long be spared to assist in what has virtually been his life's work is the fervent hope of all whose privilege it is to know this Nestor of the Union.

A Decoration for Mr. Rankilor.

THE accession to the Vice-Presidency is a perfectly legitimate excuse for a junketing, and Mr. T. P. Sykes was not allowed to go long unfêted by his many friends in Bradford. A dinner held in his honour, and that of Mrs. Sykes—a lady whose unvarying kindness and hospitality will ever be fresh in my memory—was largely attended by teachers and other educationists from

Honouring Mr. T. P. Sykes.

the West Riding of Yorkshire. The Mayor of Bradford occupied the chair, and made a notable speech in replying to the toast of "The Bradford Education Authority." He paid a very high tribute to Dr. Macnamara, M.P., and men like him who were content to put education outside politics and outside religious difficulties. He confessed that he had no belief and no confidence in the man who did not believe in compromise, and added that "the man who reduced every question to his own point of view and could not see another man's side of the question was not a man to be trusted and followed in the great question of education." Would that the Cliffords and the Hirst-Hollowells had been there to assimilate the sentiment! The toast of "Our Guest" was submitted by Messrs. R. Lishman and G. W. Carr, two representative Bradford teachers whose names are as household words from Land's End to Berwick-upon-Tweed. Mr. Sykes was cheered to the echo on replying to the toast—not a particularly easy task, when his virtues had been enumerated almost *ad nauseam*. I have watched his career at Russell Square with very great interest for the past seven or eight years, and remember with what glee I enrolled him as a member of the "red-necktie" party, after his memorable contribution to a discussion wherein he stood absolutely alone, and where subsequent events proved him the one man able to form a sound judgment on the question then under review. He wields a particularly graceful and facile pen, and on many occasions has thrown a new light on old topics in an altogether delightful fashion. His musical abilities have been placed at the disposal of teachers' meetings from end to end of the country, and to be present at the opening of the Great Horton Council School which he so ably directs, is to enjoy a pleasurable experience, the recollection of which will never fade.

THE new Executive are not showing a great amount of respect for either the practices or principles of the body which went out of office at Easter. At their very first meeting they decided to hold a third session should the necessity arise, despite the opposition of the ladies and the "old parliamentary hands." Next, they tackled the difficult and delicate subject of a "Code of Professional Honour" in resolute style; and although their predecessors six months before had determined not to touch the matter, the present Executive by thirty-four votes to twelve (three members not voting) agreed to place on the Conference agenda a motion affirming the desirability of such a Code, and asking permission to submit certain proposals twelve months later. I expected to carry my motion, knowing something of the *personnel* of the eight additions to the Board, but I confess that I was a little surprised at the magnitude of the majority. I am glad to reflect, too, that the vote was no "snatch" one, taken when many of the members had gone home. As a matter of fact, forty-nine took part in the division, the only absentee being Mr. J. T. Boulter, who was away on Union business in the provinces, and would have supported me had he been present. It is an open secret that the President—who never participates in Executive divisions—is in favour of a Code, so I can claim that 72 per cent. of my colleagues are now convinced that its establishment would further the development of a true spirit of Unionism. John Stuart Mill, in his inimitable essay "On Liberty," says: "He who knows only his own side of the case, knows little of that. His reasons may be good, and no one may have been able to refute them. But if he is equally unable to refute the reasons on the opposite side; if he does not so much as know what they are, he has no ground for preferring either opinion." In these columns I have made an honest attempt to deal with the objections to a Code of Professional Honour, and no new ones were urged at our latest debate. I was a little disappointed to find a capable woman like Miss Cleghorn dwelling on the inefficiency of written rules of conduct. I hesitate to say that she would take exception to the Decalogue, to Magna Charta, and the Statute Book, yet such seems to be the logical conclusion of her argument. That great lover of liberty, John Stuart Mill, has to acknowledge: "All that makes existence valuable to any one depends on the enforcement of restraints upon the actions of other people," and I commend his view to both Miss Cleghorn and Mr. Coward. To Mr. Harris, who spoke on the powerlessness of the Union to carry out its decrees, I humbly suggest, "Wait and see!"

Concerning Professional Etiquette.

OBJECT (c) of the National Federation of Assistant Teachers is thus stated in the rules of the organisation: "To secure the adequate representation of Assistant Teachers on the Executive of the N.U.T." As I am no longer eligible for membership of the Class Teachers' National Council, I am not quite clear as to the interpretation of "adequate representation," but the following table clearly shows the success achieved last Easter:—

Class Teachers' Representation.

No.	Name of District.	Class Teacher Representatives.
1	N. England . .	Mr. A. W. Dakers, B.A.
2	Lancashire . .	Mr. H. Pearson.
3	Yorkshire . . .	Mr. F. W. Goldstone.
4	N. Midland . .	Mr. W. B. Steer.
5	S. Midland . . .	Mr. J. T. Boulter.
6	E. Anglia . . .	
7	S. England . .	Mr. C. T. Wing.
8	W. England . .	Mr. T. H. J. Underdown.
9	Wales	Mr. F. W. Pepperell.
10	N. London . . .	Miss S. E. Jobson, Mr. J. J. Cullum.
11	E. London . . .	Messrs. W. Hurden, R. T. Mawboy.
12	S. London . . .	Messrs. W. P. Folland, W. A. Nicholls.

Every electoral district, save East Anglia, now numbers amongst its representatives at least one capable class teacher, and the total is fourteen, an increase of six over last year's strength. The talented leaders of the N.F.A.T. are fully aware of the force of the Italian proverb commencing *Chi va piano va sano*, and are not, I imagine, at all likely to insist on representation according to their numbers in the N.U.T. They will doubtless forgive the first President of the N.F.A.T. for suggesting that, in the future, they should strive to secure as their "official candidates" men whose capacity and calibre are far *superior* to those of the average Executive member. Amongst the above, Mr. F. W. Goldstone is marked out, by common consent, as a future President of the Union, whilst Mr. W. A. Nicholls, should he

develop ambitions in this direction, strikes me as much the most likely candidate to take the Union's Blue Riband back to the mighty metropolis.

THE Council, under the able chairmanship of Mr. W. Brenchley, continues to clear its agenda in a single session. This, of course, is mainly due to the efficiency of the labours of its Committees. Occasionally I am tempted—as an Executive member—to envy the readiness and promptitude with which the Council accepts the recommendations of its standing committees. The committee work of the Executive is done equally well; but I suppose one must attribute the passion for discussion to a desire for thoroughness, and a willingness to share the responsibility for every administrative act. Two well-known faces were missing, and the Council's regrets were freely expressed at the serious and prolonged illness of Miss Stone and Mr. C. W. Hole. East Anglia had honoured Mr. Baldwin with a "walk over" at the last Council election, as a recognition of his lengthy and valuable services on behalf of the fund. His success at the Executive polls consequently created a vacancy, and the Council was confronted with an array of aspirants, presenting a veritable *embarras de choix*. The final choice lay between Messrs. F. B. Gale and W. E. H. Wilson, and greatly as the Council would have welcomed the genial presence of the worthy Norfolk rural, it was necessary to substantially acknowledge Mr. Wilson's devoted work as a local secretary. An attempt was made to divert the granting of "Loans" to the Finance Committee, but it was pointed out that the consideration of applications for loans called often for as much tolerant sympathy as applications for relief, and that the two things were practically inseparable. This view appealed strongly to the Council, and the *status quo* was retained by eleven votes to eight. An experience of some years impels me to the conclusion that this granting of loans is the most difficult and least satisfactory of the Council's operations. And as "surety" for two individuals able to "spin a long yarn" and virtually repudiate their obligations, my faith in the protestations of some people has been rudely shaken. My advice to all my readers is: "*Never* act as a surety!"

"B. and O." Council.

A. C.

NOTES FROM THE NORTH.

FROM the Report of the Privy Council on Education we note that there has been this year a most gratifying increase in the number of scholars on the registers of schools, namely, 1·02 per cent., with an increase of 1·94 per. cent. in the average attendance. The percentage has thus reached high-water mark, and now stands at 85·98 per cent. Of the 793,492 scholars on the registers, 682,269 have been present each day, thus leaving 101,223 absent every time that the schools are open, as against 116,184 last year. Whether this actually means that the people of Scotland are becoming more desirous of giving their children a good education, or that the army of "regular irregulars" is becoming more attenuated, it were difficult to say, but that the number of older children is increasing seems to point to the former being the more correct supposition. The number of children over fourteen years of age is 21,519. The number of certificated teachers has increased from 12,195 to 12,801, a proportion of one certificated teacher to every 54 pupils. This gratifying increase in the number of certificated teachers gives reason for the belief that school managers are now realising that unskilled teaching is detrimental to the highest interests of education. The average salary of a schoolmaster (whether principal or assistant) is now £149, 12s. 7d.; that of a schoolmistress, £75, 17s. 5d. Last year the figures were respectively £148, 2s. 1d. and £74, 7s. 10d., so that while the male teachers show an increase of £1, 10s. 6d., the increase for the mistresses is £1, 9s. 7d.

Education Statistics.

TO the Report a very interesting chapter has been practically added on the question of supply of teachers. This, no doubt, is largely the outcome of the discussion in many quarters on the dearth of teachers. It is an attempt on the part of the Department to show that the teaching profession has still some attractive power. In the Report it is stated that the proportion of qualified teachers to the average number of children might with advantage be improved, especially as regards the supply of trained teachers. As we have shown above, there are indications of a tendency towards improvement in this respect. But when it is noted that in Higher Grade Schools the number of pupils to each teacher is limited to thirty, and in supplementary classes to forty, it will be obvious that though the average to each teacher is fifty-four pupils, there must in many schools be very large classes taught by certificated teachers, or a great deal of the teaching must be given by uncertificated teachers. This, of course, is not as it should be, and the Department does well to call attention to the fact that there is room for improvement.

Teaching Power.

A COMPARISON with the figures of last year shows the number of certificated teachers actually employed to have increased by 615, whilst the number of Article Seventy-Niners, or Ex-P.T.'s, has increased by 154, to 769 in all. The increase in average attendance during the same period has been 12,980, which would account for only 295 of the additional teachers, leaving 474 to be accounted for by the more liberal staffing arrangements adopted by school managers. Careful inquiry as to the cause of teachers retiring from active service has been made in all cases where certificated teachers have relinquished their appointments, and a summary is given of this inquiry for the year 1904—so far as teachers who are not known to have taken up fresh engagements in Scotland are concerned. We find that the number is 718. Of that number 268 have been married, 99 have left owing to ill-health, 53 have died, 46 have retired owing to age, 47 have changed their profession, 37 have gone to South Africa, and 83 have invaded England.

Losses to the Profession.

THE question as to whether Scotland is to have a new Education Act in 1905 is almost settled.

The Education Bill.

Once again, through lack of earnestness on the part of the present Government, the Education Bill is likely to be sacrificed for want of time. This is a matter of great regret, inasmuch as 1906 is the period of the triennial elections of School Boards, and when the sword of Damocles hangs over their heads by a very slender thread it is not likely that men and women will be willing to devote themselves to the work of education and become members of School Boards whose hours are, as it were, numbered. Great efforts should have been made to put an end to the present state of unrest and dislocation. It might easily have been arranged had there been on the part of those in authority any great desire to see the present Education Bill placed upon the statute book of the country. Sir Henry Craik, the late Secretary of Scottish Education, made at Perth a most pathetic appeal to the Government to save the situation; but the latest utterance of the Prime Minister on the situation gives us little hope of seeing the much-desired and much-required reforms carried out. Was it foresight on the part of the Department that determined on remedying the present system of the Training of Teachers by a Minute and not by an Act? If so, then indeed they are to be congratulated, for from present indications it would appear that the Councils to be formed for that purpose will have sat two or three years ere the Provincial Councils are established.

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Leaving Certificate Examinations.

THE Leaving Certificate Examinations are now over, and doubtless when the results appear we shall find that the number of candidates has largely increased. But this increase is more apparent than real. For we find that in very many cases pupils and pupil-teachers are being presented again and again in the same subject and in the same grade of the subject in which they have already gained certificates. From an educational point of view I have no doubt something could be said for this plan; but when it is done, as it is in not a few quarters, simply to advertise the number of certificates gained, then something should be done by the Department to stop this abuse. Many instances are known in which this system of frequent presentation in lower grades is carried on *ad nauseam*. The best way would certainly be for the Department to prevent this altogether. No doubt at present the Department issues regulations in which it says that such presentations are to be discouraged. But notwithstanding this many schools still continue to practise this, and the only way to prevent it in future will be for the Department to cry "Halt." In not a few cases it is a positive hardship on pupils to be kept passing the same standard of examination, especially in English, Latin, and Mathematics. In several rural newspapers the results are published and comparison of school with school made, but no reference is given of the number who have gained the same grade of certificate for two, three, or more years.

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Inspectors' Reports.

IN many parts of Scotland there has been an outcry against the publication of Inspectors' reports on schools in the press. It would appear as if this outcry had at length reached the ears of the Department, for rumour has it that reports are to be stopped. What good they at present do it is difficult for one to say. They may instruct school managers as to the virtues or failings of their staffs, but in nine cases out of ten the examinations are not qualified to find these out. In one or two centres School Boards are beginning to sneer at Inspectors' reports as being in all cases too laudatory, and have resolved to institute an examination of their own. This examination will, I venture to think, prove a failure, for unless the examiner is able in person to visit the school, see the surroundings, and look upon the children examined, it will be worse than useless. To set a uniform standard for all pupils, irrespective of the district to which they belong, especially in large centres, and to take no account of anything, attendance, health, &c., except age, is simply utopian, and would never be thought of by any person who knows anything about schools or educational methods. Yet such is likely to be done in one or two parts of Scotland soon. That our present Inspectors do know most of these circumstances is the reason why they are at present too critical or too severe.

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Inspectors.

THIS, of course, leads up to the question, Who should be Inspectors? Personally, I think the day of University Dons is past. The Inspector ought to be a teacher, who is thoroughly acquainted with child nature, school keeping, and school organisation. He should have had ample experience as a class teacher, organiser, and head teacher. Without that experience you may as well send a cavalry officer to inspect our schools. This, of course, means that the present age limit of thirty-five must be abolished. It is hardly possible in these days to find a teacher who has gone through the various subordinate positions in a school, and has reached a headmastership, much before the age of forty. The Department would be well advised in giving the matter of appointment to Inspectorships their most careful consideration at the present time. The time for so doing is most opportune. The Inspector should be counsellor and friend of the teachers; he should be able to advise the headmaster of a school as to the best methods of organisation and classification; he should be able to show class teachers the best methods of teaching, the errors to be avoided, the difficulties to be met, and the best ways to overcome these. To appraise a school from the results of written tests in arithmetic or writing does not need an expert in education: to be an Inspector does.

R. D.

THE HARMSWORTH ENCYCLOPÆDIA PRIZE COMPETITION.

AWARDS IN THE SECOND SERIES OF COMPETITIONS.

OWING to pressure on our space this month we are unable to publish a detailed account of the awards in the above competition. The successful competitors have, however, been communicated with.

THE ORIGIN OF LIFE.

IN all ages life has been regarded as a profound mystery. It has been regarded as a thing apart —something before which the human mind could only bow, and never dream of producing. Indeed, the feeling that life cannot be restored, explains the horror with which the taking away of life even from one of the lowliest of creatures is universally regarded.

Not only was the division between living and non-living matter regarded as a rigidly fixed and insurmountable barrier, but it was thought that those substances, such as starch and sugar, which are usually produced by the action of living matter, could not possibly be produced without the action of what was called "vital force." Hence such bodies were called "organic" substances. In 1828, however, a German chemist, Wöhler, showed that this distinction would no longer hold, for in endeavouring to prepare ammonium cyanide, he found that the substance crystallised out as urea, a body which up to that time had been produced by the action of the kidneys. Since that time numerous other "organic" substances have been produced artificially, in may cases with important commercial results.

The labours of physiologists have shown that the majority of "vital" processes are in their essence physical or chemical changes. But the grand question, "Can living matter be produced from non-living matter?" still remained unanswered. Men of science invariably arrived at the conclusion that there was no evidence to show that it had been done, and no evidence to prove that it could not be done. We cannot do better than quote the words of Huxley on this point:—

"With organic chemistry, molecular physics, and physiology yet in their infancy, and every day making prodigious strides, I think it would be the height of presumption for any man to say, that the condition under which matter assumes the properties we call 'vital,' may not some day be artificially brought together. All I feel justified in affirming is, that I see no reason for believing that the feat has been performed yet.

"And looking back through the prodigious vista of the past, I find no record of the commencement of life, and therefore I am devoid of any means of a definite conclusion as to the conditions of its appearance. Belief, in the scientific sense of the word, is a serious matter, and needs strong foundations. To say, therefore, in the admitted absence of evidence, that I have any belief as to the mode in which the existing forms of life have originated, would be using words in a wrong sense.

"But expectation is permissible when belief is not; and if it were given to me to look beyond the abyss of geologically recorded time, to the still more remote period when the earth was passing through physical and chemical conditions which it can no more see again than a man can recall his infancy, I should expect to be a witness of the evolution of living protoplasm from non-living matter. I should expect to see it appear under forms of great simplicity, endowed, like existing fungi, with the power of determining the formation of new protoplasm from such matters as ammonium carbonates, oxalates, and tartrates, alkaline and earthy phosphates, and water, without the aid of light. That is the expectation to which analogical reasoning leads me; but I beg you once more to recollect that I have no right to call my opinion anything more than an act of philosophical faith."

The wonderful advance in scientific knowledge marked by the discovery of Röntgen rays, and still more by the discovery of the marvellous properties of radium, has recently led Mr. J. B. Burke, of the Cavendish Laboratory, Cambridge, to conduct a series of experiments, in order to determine whether any connection could be established between the action of radium and "vital" energy.

It is well known that if a quantity of an infusion of a vegetable substance, such as hay, or of beef-tea, be kept for a time it will undergo changes, and micro-organisms will be found in it which were not there before. This fact suggested the idea of "spontaneous generation" as the explanation, but the matter was very carefully investigated by Professor Tyndall, who showed that if the infusion were placed in test-tubes which were closed while hot with plugs of cotton wool, it might be kept an indefinite time and no organisms would make their appearance. Hence he came to the conclusion that the organisms were derived from the dust particles in the air, which were in fact nothing but the bacteria in a desiccated state floating about, and which might be filtered out from the air and kept from the liquid by the plug of cotton wool. This process is called sterilisation, and is much employed in preparing a medium in which bacteria of any given type may be introduced and cultivated.

By experimenting on a sterilised medium under the action of radium, Mr. Burke succeeded in obtaining some microscopic bodies not there before, and which seemed to exhibit signs of life. To these he gave the name of *radiobes*.

In order to estimate the true importance of these observations a clear logical investigation is necessary. It may be suggested that the cultured medium was not effectively sterilised. But had this been so the organisms which made their appearance would have been of the common and well-known types. It has also been suggested that they may be crystals of carbonate of lime, which in some respects they resemble. Carbonate of lime crystallises from water in rhombohedra as exemplified by calc spar and Iceland spar; but it was shown in 1858 by Rainey that it forms little spherical or ovoidal masses when precipitated from gum, gelatine, or other viscous fluid. Some of these bodies show marks of fission, though the marking is more probably due to the adherence of two bodies in process of formation than to the cleavage of a perfectly formed body. Some of them also seemed to show traces of a nucleus. These phenomena suggest a relation between the bodies and the rudimentary forms of life known as bacteria, for these are nucleated, and, to use an arithmetical paradox, they multiply by division. These little nodules of carbonate of lime are insoluble in water, whereas the radiobes are soluble in water, and hence not only differ from calcium carbonate crystals, but also from any known form of fully developed living matter. But this point presents a difficulty, for although we are not familiar with living beings which can dissolve in water, we have no *à priori* reason for assuming that there may not be some primitive form of life which is soluble.

When radiobes are examined under polarised light they have no effect on it, whereas crystals rotate the plane of polarisation. This is another important distinction between radiobes and any known form of crystal. There remains another explanation of the appearance of Mr. Burke's radiobes. They may be organisms which were present in the bouillon before sterilisation, and which are capable of resisting a temperature which certainly kills off all other organisms in it. But as such bodies have not been detected in the presence of known bacteria, there is no evidence whatever of their existence.

Mr. Burke is careful not to commit himself to any dogmatic statements about his results, but seems to consider that the radiobes are something on the border line between crystals and microbes, and mark probably that critical state at which the distinction between vital and non-vital bodies ceases to exist, just as in the experiments of Andrews the line of demarcation between liquids and gases was shown under certain conditions of temperature and pressure to cease to exist.

The discoveries have awakened a very wide interest among scientific men, but there is a remarkable consensus of opinion that it is desirable to prosecute the researches further before any definite conclusions can be formed.

THE TRAINING OF TEACHERS.

THE new regulations for the training of teachers are now issued, and in detail there are very few changes to note, but the general effect of the alterations introduced will undoubtedly be to reduce the standard of attainments in the teachers in our elementary schools. The great amount of time and energy devoted by teachers to their own qualifications is a proof of the concern with which they will regard any retrograde steps in this direction.

The rule for admission to Training Colleges used to require that a candidate should pass in the first or second class, and even this arrangement often led to injustice, for it was possible to exclude a first class candidate in favour of one in the second class. Now the Training College authorities may admit any one who is even placed in the third class. This removes a valuable incentive to work during a Pupil Teacher's apprenticeship, though it may be a great boon to institutions which are now permitted to instruct Pupil Teachers, and which are not likely to do the work efficiently enough for many of them to pass in the first class.

The third paragraph of the prefatory memorandum is entitled "Prohibition of Preparation for Matriculation Examinations," and it says: "In the past students have been commonly prepared for a Matriculation Examination during a two years' course of study. Owing to the lack of proper arrangements for the education of Pupil Teachers, this plan has in many cases been reasonable, but the Board are of opinion that the rapid development of properly equipped Pupil Teacher Centres makes it desirable that such preparation should now cease." At first sight this seems to be a compliment to the Pupil Teacher Centres, which of late years have taken such an enormous number of places on the London Matriculation List, but the hollowness of the whole plan is evident to any one who is familiar with the efforts being made to crush Pupil Teacher Centres out of existence. The course at the Pupil Teacher Centres has been reduced to a two years' course, and "where a Higher Elementary School or a suitable Secondary School is available it is desirable that the boys or girls who intend to become Pupil Teachers should receive their instruction in one or other of those Schools," and Preparatory Classes at Centres are allowed only "where it is shown to the satisfaction of the Board that no other facilities exist for the instruction before the age of sixteen of boys and girls intending to become Pupil Teachers." We cannot but regard the changes as an attempt to lower the attainments, and as a result the standing, of the elementary school teacher.

The same policy is shown in the article in the New Code on supplementary teachers. Hitherto the "Article 68" was required to be over eighteen and a woman, now the last condition is removed and "Article 68" can be a man.

We have read these regulations with great regret.

THE NEW CODE.

THE Code for this year is very late in making its appearance, although the changes from that of last year are not very numerous.

Under recent Codes the grant on children ceased on their fifteenth birthday, the present one allows grants to be claimed on their attendances up to the end of the school year in which they attain the age of fifteen, and if no suitable higher education is available within a reasonable distance of the school, the attendances may count up to the scholar's sixteenth birthday or even beyond, with the consent of the Board of Education.

More or less definite rules are laid down for the curricula of Higher Elementary Schools, and rather invidious remarks are made in comparing these schools with Secondary Schools. "For example, the question of introducing French into the curriculum may arise. In a Secondary School the teaching of French may be regarded as a first step towards introducing the scholars to the literature and thought of France, and though this use of the language may not be fully realised in the Secondary School, yet the course is long enough to ensure that the scholar will have an opportunity of acquiring a literary as well as a practical knowledge of the language, useful for this or for other ends. A thorough study of language has also a value in intellectual training." In the Higher Elementary School, however, "its introduction is best considered solely in relation to the question of immediate usefulness in employment. If in the locality there is a great demand for a knowledge of some foreign language in the ordinary routine of business it may perhaps be proper to give the scholars of a Higher Elementary School such a knowledge of French as would enable them, on leaving school, to attend with advantage special classes in the use of that language for business purposes. The circumstances of the locality must determine the propriety of attempting to teach French at all in a Higher Elementary School."

Could any regulations more plainly set out an intention to give grounds for the sneer so often raised without foundation, that the secondary pupil has "culture" and the primary one has none? Why should the Higher Elementary scholar be debarred from taking a first step towards an acquaintance with the literature and thought of France—a use of the language which the Code so naively remarks, "may not be fully realised in the Secondary School"? In that case the Code might suggest that the Secondary scholars should feed the evening classes at the Polytechnics.

The new Code sets out that whereas the Inspector was bound to approve any time-table that complied with Section 7 (2) of the Elementary Education Act,

1870, as regards the restriction of religious instruction and observances to the beginning or end of the school meeting, or both, he can now insist on the apportionment of time to the different subjects according to his fancy, and thus he will be able in the future not merely to advise that a particular subject should not be taken, but to limit the education of the children by requiring the subject to be eliminated from the time-table altogether.

We regret to see that men may be recognised as supplementary teachers on the feeble condition that the candidate has been under efficient instruction, for some period at least, after reaching the age of fourteen and has, in addition, given proof of an intention to obtain a higher qualification under the Code. How this weak condition is to be enforced we are not told.

The Board of Education seems unable to make up its mind on the question of the provision of instruction for children under five, and so leaves each local authority to settle the matter to its own fancy.

THE ELECTRON THEORY OF MATTER.

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AMONGST mathematical physicists who have endeavoured to show that all *matter* has an *electrical basis*, the names of Dr. J. Larmor, and Prof. H. A. Lorentz, stand out most prominently. Most of Larmor's work is to be found in the *Transactions of the Royal Society*, whilst a great deal of it is to be found in his magnificent book, "Ether and Matter," published as an Adam's Prize Essay by the Cambridge University Press.

Sir Oliver Lodge has done a great amount of work in developing this theory, especially in expounding it in such a way as to bring it within the comprehension of those who do not possess the mathematical genius of a "Larmor." Lodge plainly sets forth that the constituents of the atom are the electrons, which are charges of electricity and nothing else; that is, there is *no material nucleus*. This means that the entire atomic properties must be due to an aggregation of electrons of opposite sign, of which one or two are comparatively free and detachable. Before proceeding farther, it may be well to put the essentials of this theory briefly, if crudely, thus: *Matter consists of electrons, the atoms themselves being composed of electric charges (electrons), and the fundamental inertia-property of matter is identical with self-induction.* If this hypothesis be accepted, we are driven to the conclusion that there is no "Inertia" but *Electric Inertia*, which is now known under the name of Self-Induction; that is to say, what we look upon as ordinary material inertia is due to the self-induction of its constituent electrons. The reaction between the electric and magnetic fields, which always occurs whenever there is any velocity change, gives a simple explanation of electric inertia.

Size of Electron.—Sir O. Lodge tells us that the electron has a radius of the order of 10^{-13} cm. or one-hundred thousandth of a molecular magnitude (10^{-8} cm.), and that the charge that it carries is about 10^{-10} electrostatic units. Such a minute size as given above explains the penetrative power of the Cathode Rays, and indicates the enormous amount of free space there must be in the ordinary atom. To put the matter forcibly, one may say that the electrons in an atom are as far apart in proportion to their size as the planets of the solar system are, in proportion to *their* size. In an atom of Hydrogen there are about 700 electrons, in an atom of Sodium 23×700 (16,000), whilst in an atom of Mercury there must be over 100,000. One might be tempted to think that the Mercury atom would be rather crowded, but not so, as our planetary analogy still holds good. This will, perhaps, be made clearer by considering the relative amounts of *occupied* space and *empty* space. Lodge states: "The whole volume of the atom is 10^{-24} cc., the aggregate of all the electrons composing the atom is $10^5 \times 10^{-39} = 10^{-34}$ cc., consequently the space left empty is 10^{10} or ten thousand million times the filled space."

We may put this in another and perhaps more easily-realised manner, thus:—

$$\frac{\text{Volume of space available to particles}}{\text{Combined volume of all the particles}} = \frac{10^{-24}}{10^{-34}} = 10^{10}.$$

i.e. the mean free path of the electron in an atom of Mercury is about 10^9 times the size of the electron itself. One naturally would expect that in less dense substances the distance which the electron can travel before a collision takes place, would be greater, and this is so. It is estimated that the force required to stop *one* electron is about the tenth of a dyne. This being so, one is somewhat prepared for the enormous radiation effects (such as X-rays) which are produced by the sudden stoppage of electrons. To take a more definite example, it is found that the "Power" required to stop an electron, moving with a velocity equal to one-thirtieth of that of light, inside a molecular thickness, is about 10 watts (volt-amperes). It must be remembered that only a small portion of this actually goes in radiation, the greater part taking the form of heat. To increase the radiating power the two following conditions must be fulfilled:—

(1) Velocity must be near that of light.
(2) The stoppage must be very sudden.

Suppose that an electron is moving with a velocity one-tenth that of light, and that it is stopped in a distance equal to its own diameter, only about 10 per cent. of the total energy will be radiated, the remainder taking the form of heat mostly. In moderate vacua, the target in an X-ray tube gets red hot, indicating that almost all the energy is being converted into heat; this is due to the diminished velocity of the electron in a moderate vacuum.

Favourable Experimental Evidence.—This can only be referred to but briefly, and the student who is anxious for further details must refer to the various original papers. Prof. Kaufmann (*Comptes Rendus*, October 1902) made a number of striking experiments which certainly support the theory as given above. In certain cases the Kathode rays attain a speed approaching that of light, and in such cases the increased inertia should be observable. This is what Prof. Kaufmann did observe, by comparing the electric and magnetic deflection of the same set of rays, submitted simultaneously, or successively, to an electric or magnetic field. By this means Kaufmann determined the velocity and e/m ratio (e = the electrostatic charge 10^{-10}, and m = the

mass), and as a result of these determinations Kaufmann concluded that when the velocity was near that of light, the Electro-Chemical-Equivalent (m/e) was increased by the amount required by the purely electric theory of matter, and that, quantitatively speaking, there was no room for any additional inertia due to the presence of non-electric matter travelling with the electron. Prof. J. J. Thompson has analysed and verified Kaufmann's experiments, and has conclusively proved that by deflecting the streams of charged carriers, by means of magnetic and electric forces, the ratio of the charge (e) to the mass (m), or, e/m, is constant, no matter what the source of the ion or what the gas (*vide* Thompson's "Conductivity of Electricity through Gases," Chapter V.). In Chapter VI. of the same book, we get an account of the measurement of the charge by Prof. Thompson and his pupils. These measurements were made by a series of very ingenious experiments based upon Wilson's discovery that gaseous ions act as nuclei for the condensation of moisture. The charge on these ions was found to be the same as that carried by a Hydrogen ion in solution.

Remarks and Criticisms.—Sir O. Lodge maintains that the Electron Theory not only gives us an explanation of chemical and molecular actions (including cohesion), Rontgen radiation, Kathode rays, and Radio-activity, various astronomical and meteoric phenomena (*e.g.* solar corona, comets' tails, magnetic storms, and auroræ), but that they follow as a natural consequence, and further that the theory leads to one grand "Unification of Matter." In addition it may be said that the theory gives us an intelligent explanation of Mendeleef and Newlands' Periodic System, and also of Spectroscopic Phenomena.

There is no doubt that the Electron Theory is the most comprehensive ever advanced, but it must be remembered that any "Universal Theory," which this is claimed to be, must surely be able to explain *all* fundamental properties of matter. Gravitation, cohesion, and inertia, are essentially fundamental. With regard to the two last—cohesion and inertia—a satisfactory explanation is forthcoming, but this theory does not as yet help us to an explanation of gravitation—the Newtonian attraction of matter for matter. This failure to explain Gravity is undoubtedly the weak spot in the armour of the Electron Theory, and unless it can ultimately do this for us there is no doubt that it will have to give way to one which does. Lodge, however, thinks that when the theory is more complete, there is every probability that "Gravitation Property" will fall into line, and form part of the theory. At present it is merely an observed and empirical fact, as it has been for centuries.

It has also been suggested that any completely unifying theory should be able to supply us with an explanation of our "pains and pleasures." It is worth remarking that at the recent British Association meeting at Cambridge, Lord Kelvin seemed to prefer the term "Electrion" to Electron.

Prof. J. J. Thompson seems to imply that, in the ultimate, there is both *matter and electricity*, whilst Sir O. Lodge definitely maintains there is only electricity. One cannot conclude this paper without referring to Mr. Balfour's Presidential Address at the British Association meeting already referred to. In fact it supplies one with some very interesting reading in connection with the subject under discussion. Mr. Balfour undoubtedly expresses the feeling of many when he states that he finds "acute intellectual gratification" in contemplating the bold speculation of the scientist; the satisfaction given to him by a study of the new theories of the primal constitution of the universe is "almost" æsthetic in its intensity, but there his appreciation seems to end. He is delighted with the beautiful structure, and is lost in admiration at the ingenuity and industry of the builders, but he looks at the foundations and finds them unsound. In fact he concludes that the whole edifice is a fascinating mirage, lacking "physical reality." Certainly Mr. Balfour puts the matter very quaintly when he says that—

"Matter is not only explained, but is explained away." He argues that we are not equipped—either physiologically or mentally—for higher physical investigation, hence our conclusions are defective.

To return once more to Sir Oliver Lodge, we find him asserting at a lecture he delivered in Birmingham, early in 1904, that the whole phenomena connected with Radium were intelligible and simple on the theory that Radio-activity is due to atomic disintegration. Thus spontaneous breaking-up of the atom follows from the electron theory, as does also the mutability of matter, which has been brought within the bounds of being actually—it is hoped—observed by Sir William Ramsay's researches this year.

In conclusion, one must say that whilst there are a few weak points in the theory, notably the inability to explain Gravity, its strong points are many, as this is the first single theory which has been able to supply us with feasible and intelligible explanations of Inertia, Cohesion, Electric Conductivity, Radiation, Heat, Light, Electricity and Magnetism, Röntgen and Kathode rays, and Chemical Affinity. Such a theory is undoubtedly the greatest yet given to Science, and one can only hope that if in the near future the theory is completed to the second order, or some higher *even* order of small quantities, that Gravitation and all other outstanding properties will fall into line, and thus let us have one great unifying Scientific Theory.

EDUCATION IN FOREIGN LANDS.

Italy.—A new law on education takes effect in Italy this year. The debates in the Chamber mainly centred round the conflicting claims of the Commune and the State to take the greater share in the administration of educational affairs. In a country where illiteracy so much abounds as in Italy there does not exist in many Communes a sufficiently strong sentiment in favour of efficient education, and it is therefore a matter of congratulation that the new law gives the State greater power than before in dealing with rural communes. In considering the minimum salaries fixed by the new law one must remember how much farther money goes in Italy. In small schools conducted by one teacher the minimum salary must not be less than £20. In schools of more than one class, rural masters receive from £36 to £40 per annum, and their urban confrères from £46 to £60. The corresponding salaries for mistresses are: in the country from £30 to £34, and in the towns from £38 to £52. An important ministerial decree reorganises the system of direction of primary schools. A director, or, as we should say, a head teacher, may have several schools placed under

his direction. In order to be qualified as a director not having the responsibility of a class, a candidate must be at least thirty years of age, and possess the diploma of Inspector of Schools or of Director. The latter examination is mainly a searching test of the candidate's theoretical and practical acquaintance with pedagogy. His duties mainly correspond to those of a head teacher with us. Should a teacher be absent, he must take his place, with the proviso that he cannot be compelled to do this for more than five days per month.

United States.—The question of corporal punishment in New York schools has from time to time been the subject of discussion amongst teachers, who find the efficiency of their work seriously lowered by the existing rules. At a meeting called to discuss the question, 223 out of 268 head teachers voted in favour of putting the power of corporal punishment in their hands. The Board of Education, however, by a large majority refused to allow punishments of this character in the schools.

The regular medical inspection of schools by doctors appointed for the purpose is much more frequently the case in the United States than it is with us. To such an extent is this carried on that in many places the doctor is practically omnipotent in the schools. It has fallen to a medical man, Dr. E. J. Lederle, to point out the evil results which follow from this excessive power being placed in the hands of the doctors. As a remedy he proposes the formation of commissions composed of doctors and teachers, to watch over questions of school hygiene and sanitation. The teaching element in these commissions would be able to prevent decisions being arrived at which would seriously upset the working of the schools.

Greece.—The organisation of education in Greece is in one important respect in advance of that of most European nations. There is absolutely no overlapping in the various types of schools. A child cannot receive primary instruction in the second class of schools, and he can only pass from one grade of school to another by passing an examination. As private schools are rare, it follows that practically every one commences his education in the primary school. The primary school has four years of study, and leads to the Hellenic school with its three years' course. The first two of these years corresponds with the two years of the higher elementary school, and it is proposed therefore to abolish this grade altogether, and to add another year to the course in the Gymnasia, which now have a four years' course. From the Gymnasium the student passes to the University, which has four years of study, so that the child who enters the primary school at six years of age can obtain a University degree at the age of twenty-one. Out of every 100 children entering the primary school, 12 go on to the next grade, 3 to the Gymnasium, and 1·5 to the University. Primary education is entirely free, a charge only being made for the leaving certificate. In the three ranks of schools above, the charges are respectively 4, 25, and 100 drachmas a year. The revenue thus obtained amounts to about 600,000 drachmas a year, which is devoted to the construction of new schools. The cheapness of education, and the facilities for passing from one grade of school to another, tend to the overcrowding of the professions. From the educated classes, who thus find themselves crowded out in the struggle to obtain a livelihood, the ranks of the professional politician find their chief source of supply.

Holland.—The first step in the introduction of the new School Bill has been taken. The Second Chamber decided by 52 to 39 votes to proceed to the immediate discussion of the Bill. The origin of the present conflict dates back to the year 1878, since when religious teaching has been excluded from public schools. The result of this decided attitude was that private schools were opened in various parts of the country, the attendance at which has grown from less than a fourth to nearly one-half of the total attendance in public elementary schools. An agitation arose, and gathered gradual force, for granting a State subsidy to these schools. The "anti-revolutionary" Protestants and the Roman Catholics succeeded in getting the reins of power, and in 1899 an Act was passed granting to each denominational school a State subvention at the rate of 30 per cent. of that granted to a public school of equivalent size. In 1901 the State undertook the responsibility for a large proportion of the cost of the buildings of these schools, and the present Bill proposes that the teachers in these schools shall be paid directly out of State funds. Only the cost of school materials is left unprovided for, and as school fees are charged in all schools, the opening of new denominational schools will be attended with no financial risk to their promoters. Purely from an educational point of view, it is much to be regretted that this Bill proposes to allow grants to all schools with an average attendance of twenty-five scholars at least. The teachers in the public schools are much opposed to this Bill. It is particularly feared by them that, under a régime which puts more power into the hands of the clergy and "anti-revolutionaries," they will not enjoy the political freedom they have become used to. Many Dutch teachers are active politicians, especially on the Socialist side, and cases have not been infrequent of attempts being made to inflict professional injury on those who have been boldest in their political utterances.

Germany.—On the debates on the education estimates in the Prussian Parliament, the *Pädagogische Zeitung* remarks: "So far as the primary school is concerned the debates on the education estimates have rarely ended more hopelessly than this year." To all demands of the primary teachers for an improvement of their position the Education Minister has responded with a decisive "No." Training College teachers have received some slight improvement in their salaries, and new training colleges, and schools to prepare teachers for admission to these colleges, have been founded, in the hope that the output of teachers will in the future, as in the past, be sufficient for the needs of the schools. The clerical oversight of the schools remains as before, although it is on many sides condemned, and felt by the most enlightened of the clergy themselves to be a burden.

The economic position of teachers in the large towns of Germany is markedly better, even when the difference in the cost of living is taken into account, than that of the rural teachers. The Berlin teachers have, however, long complained that their salaries are not on a scale enabling them to live as they should in the capital of the Empire. In Hamburg teachers are much better paid, and now the teachers of the suburban district of Charlottenburg have been placed under an improved scale, which only awaits the sanction of the Government to become operative. The men teachers of Charlottenburg commence with 2200 marks annually, and rise by nine increments of 250 marks each to a maximum of 4450 marks. A sovereign is worth a little over 20

marks, so that the salaries are better than the best-paid class teachers in England receive. Women commence with 1800 marks, and proceed to 3150 marks. The teachers in Charlottenburg are now better paid than those in Hamburg. The Berlin teachers have renewed their agitation for better financial treatment, but have only succeeded in getting an additional allowance of 102 marks as an indemnity for lodging, making the commencing salary of the men teachers 1950 marks. At a meeting attended by nearly 1000 teachers, resolutions were passed calling attention to the fact that the teachers had been treated less generously in regard to their financial position than other municipal employees, and asking that the new scale of payment for magistrates' clerks shall be extended to them.

FRENCH GIRLS' SECONDARY SCHOOLS.

BY AN "ENGLISHWOMAN ABROAD."

AFTER the paper on the Lycée for boys at Dijon in the March number of the *Practical Teacher*, our readers may be interested to hear something of the girls' schools as seen from within. In the following paper we confine ourselves to general impressions from observations made in the Paris Lycées, and from a special internal knowledge of a leading provincial Lycée. A subsequent paper will deal with methods of instruction and their practical bearing on English class-teaching.

On a logical and order-loving mind first impressions of a French Secondary School are apt to be misleadingly favourable. The teacher emerging from educational chaos in England finds imposing modern buildings, an exact and detailed organisation, professors with a thorough knowledge of their subjects, and docile children. Here is surely a new and ideal educational world! And yet some months' insight into the working of the system leaves one with the impression that the spirit has not yet moved on the face of the waters—that the ideal is not attained.

That France has created a comely *form* is incontestable. Though the class-rooms of the Écoles Communales are at times crowded, over-heated, or badly ventilated, the Lycée premises are as a rule excellent. In the case of some of the boys' schools (*e.g.* S. Cyr, or the Lycée Hoche of Versailles, or the Lycées Charlemagne and Michelet at Paris) old buildings have been adapted to modern requirements; but, as the law creating the girls' High Schools only dates from 1880, the buildings are for the most part quite modern and hygienic. The rooms are spacious and high, and are well heated by *caloriferes;* windows are large, and always on the left-hand side of the room as the pupils face the platform; there is also plenty of space for the teacher of peripatetic tastes between the desks. In some schools there are blackboards all round the walls of the room; but, although they are *fixed*, we have never seen a child complain that the light strikes the board. The decoration of the rooms is, however, much neglected; large, badly drawn, and highly coloured railway advertisements are often the only "pictures" even in upper classes.[1]

[1] It is only fair to say that since writing the above, we have seen (at the excellent Lycée for girls at Dijon) two class-rooms well adorned with pictures illustrating the courses in history followed by these classes.

In most class-rooms there is a large placard giving minute directions for the prevention of tuberculosis; it is doubtless right to insist on details of personal cleanliness, and it may even be necessary to tell High School children to wash regularly, and not to spit on the floor or walls (*cracher par terre ou sur les murs*), but it seems a pity to disfigure class-room walls with unsightly placards where a few words from the teacher on the subject would suffice. To an English mind a more obvious precaution against disease would be to insist on the children changing their boots on arriving at the school. No school can be kept really clean (even in the French sense of the word) when from all parts of the town mud and germs are brought into the rooms by three hundred pairs of boots, shoes, and goloshes.

Besides good large class-rooms there are, in most Lycées, science laboratories, a studio, a study for Form VI., a large recreation-room fitted at one end with gymnastic apparatus, a good library, and a mistresses' room. The headmistress's house is generally in the school itself or near by. During the five minutes' break between the hour-lessons all the classes pour into the corridors, or, if fine, into the court or garden, so that each class starts in a freshly aired room. No order is kept on stairs or in corridors, though the instructresses stand "on charge" on each floor. Though all the schools have a court for games, and the provincial Lycées a good garden also, yet the girls do not play games in the English sense. If there is anything more comic than the football of the French boys, it is the "hockey" played, with hooked walking-sticks and a tennis ball, by half-a-dozen French girls in a quiet corner of the school court.

The teachers (*professeurs*) strike one as being thoroughly informed in their subjects, and, even if lacking in originality, are, as a body, conscientious and painstaking; under the severe system of inspection incapable or careless teachers are soon weeded out.

The pupils are intelligent and wonderfully anxious to learn; the healthy English child has an inherent dislike for routine work, but the French child is a little *fonctionnaire* in embryo, and resistance to the set order of things does not seem to enter his head.

The writer has seen a class of small children follow intelligently a dull hour's lesson of grammar, whereas an English class would have found an outlet for their energies in bent nibs, pins, or other delights. Some allowance must be made for the French child's politeness in such a case; but, when brought to the water of knowledge, his tendency is to drink.

And yet, in spite of these exterior excellences, no one who knows France as she is to-day can but doubt that the educational system *laisse beaucoup désirer*. Nearly every present-day citizen of France has passed through a Government school of some type. Thus it is natural that, when French parents complain that their children are unable to make their way in the world, to *se tirer d'affaire*, the cause should be sought in the educational system. Some years ago M. Demoulins, in his book, *A quoi tient la superiorité des Anglo-Saxons*, pointed out the radical flaw in French education. French children are brought up to depend on others; they do not even go to school alone. At the Lycée Fénélon at Paris, one may see, any morning, great girls of sixteen or seventeen being taken to or fetched from school by parents or servants. Even the École Primaire children (our Board School class), in cases where the parents cannot fetch them, are seen to certain corners

in detachments by various instructresses. Within the Lycée itself little is done to develop independence of character; the organisation is bureaucratic and centralised. The *Directrice* and the numerous other officials, *économes*, *surveillantes-générales*, and *professeurs* carry on the school. The function of the children is passive only; in no case do the girls elect officers who are responsible for school discipline and order, as in our best English schools. A natural result of this lack of self-government is an irresponsible attitude in the older girls. The larger Lycées have many half-time students who patronise a course of literature or follow lectures in *Morale*: on remarking on the lackadaisical air of one of these ladies the writer was impressively informed that the girl in question was preparing to be *femme du monde*, with the implication that serious study was out of the question in such a case!

Again, there is a lack of *esprit de corps* in the schools; there is no corporate meeting of the classes for any purpose whatever throughout the day; so that the Lycée strikes one as rather an aggregation of classes, or a sort of educational market, than as a school in the sense of a united community.

There are no prayers or "chapel" to begin the school day; for by the law of 1880, which formulated the girls' schools, no religious teaching is to be given in the Lycée itself, though it may under certain conditions be allowed in the boarding-houses. The Head does not address the whole school; for, as there are no games, there are no victories to chronicle, and examination successes are announced individually by official notice only. Thus, the great occasions of corporate mourning or rejoicing which stand out prominently in the memory of most English school-boys and girls, and which bind each to each in a common sympathy, are wanting here. Then one misses also the school clubs, the debating and dramatic societies, the magazine, and other useful agencies of the kind. It is true that many Lycées have an Anti-alcoolique Reunion meeting once a week, but this includes only certain classes, and is in no sense representative of the whole school. In fact, the French girl leaves school (as she enters it) in leading strings as far as the practical affairs of life are concerned. That she is more intelligent, and has had a more finished mental training, than an English girl we may readily acknowledge. But in after-life we doubt if her artistic taste or her elegant literary style will stand her in such good stead as the toughness of character or the tenacity of purpose which her English neighbour has acquired in the class-room or on the playing-field.

THE TEACHING OF DOMESTIC SCIENCE IN THE UNITED STATES.

(*Continued from page 8.*)

THE method of teaching differs according to the number of pupils in the class. Both oral and practice lessons are given. In small classes each girl cooks; in large classes, one-third do practical work, the rest taking notes and making observations. In Philadelphia the recipes are printed and distributed; in other cases they are written out from memory, or notes are made. No detailed account of the matter taught can be given here. Some time is generally given to the subject of fuels, properties and possible impurities of water, and the nature of the various processes used in cooking. In New York City the course ends with lessons on infant feeding and invalid cookery; in Toledo, with lessons on fermentation and table-setting. No dishes cooked by the pupils are ever sold. The pupils eat everything that they prepare, and this custom is regarded as absolutely necessary to the success of the teaching.

At the conclusion of a cooking lesson, the class is usually divided into small groups; each group undertakes some part of the work of washing the utensils used, cleaning the stove or sink and putting everything away in its place. Simple experiments are made in the cleansing properties of various materials, in the effects of acids on metal, and kindred subjects. Theoretical teaching in household cleaning outside the kitchen is sometimes given; at Brookline (Mass.) the care of a bedroom is taught. The cost of the various food materials used is always considered, and classes sometimes accompany the teacher when she makes her purchases. By these means an elementary knowledge of Housewifery is given through the cookery lessons, to prepare for the more advanced instruction in the high schools.

In an appendix, the cost of equipment for a grade-school cookery course, to accommodate twelve pupils at a time, is given as between £153 and £185. The teachers go through a careful training, and the standard of attainment is generally high. The average salary is about $500 (£100) for the first year, rising to $900 (£180). The work, especially in the centres through which many pupils pass, is hard.

Needlework is by no means universally taught in United States schools. In many, it has only very lately been introduced, to meet the growing demand for manual training. The course in needlework usually precedes that in cooking, and is carried on in Grades III. to VI. or VII. Coarse canvas and coloured thread are used by beginners. The methods of teaching differ greatly. In many cases the different stitches are executed on small pieces of calico, which are fastened into a book, and illustrative notes and diagrams are added. A better method is the application of the stitches learnt to small model aprons, pillow-slips, and laundry bags. In Boston the instruction given is so effective, that the pupils make simple blouses and undergarments at home almost without help. In Brookline (Mass.) the boys learn sewing with the girls, with excellent results. This is also the case in some Philadelphia schools. Here there are two lessons a week of thirty-five or forty minutes each, the drafting of paper patterns is taught, and the last year's course is devoted to the making of simple dresses and blouses. As a rule, the teaching given enables the pupils to conclude the course with the drafting, cutting-out, and making of garments. The teachers are invariably specially trained. The maximum salary earned by a teacher in Boston is given at $936 (£187).

The obligatory teaching of Hygiene in United States grade schools is directly due to the efforts of the Women's Christian Temperance Union, whose immediate aim is to teach future citizens the evil effects of the excessive use of stimulants and narcotics. In 1893 it was legally enacted that so many hours a week must be devoted to lessons on Hygiene and Physiology during the whole elementary school course, with the direct object of inculcating temperance doctrines. In most States, the text-books used are submitted for approval to the Council of the Temperance Union.

The methods of the Union roused considerable opposi-

tion, which still continues, as the teaching given is often crude, and the educative value of the subject, apart from its deterrent effect, is apt to be lost sight of. This feeling has led to "the more general employment of that preferable method which discards implicit reliance on the printed page in favour of more apparently spontaneous instructions by the teacher." Joint action has already been taken in Connecticut by the teachers and temperance teachers for the modification of the temperance doctrines. Similar action is expected in other States.

Hygiene and Physiology are usually taught in the lower grades through "Good Habits Talks," or through language or nature study lessons. The advantage of dealing with these subjects as part of the ordinary school curriculum, instead of in connection with domestic economy, is that boys share the instruction with the girls. Miss Ravenhill gives a description of the course at Cleveland, Ohio, as a good example of the best method of dealing with the subject. Here the parts of the human body are considered in Grade I. (with children of about seven), then the skin, the special sense organs, food and drink. This course is amplified in Grade II. In Grades III. and IV. the same points are dealt with more fully, with respiration and the circulation of the blood. In Grade V. the organs of motion and digestion form the subject-matter, with the subjects already taught in earlier grades. In Grade VI. elementary physiological experiments take the place of the simple observation of earlier grades. In the later grades more detailed anatomy is taught, illustrated by some dissection, and various processes of the body are more minutely considered.

In the schools of some cities, models and charts are used, but, on the whole, illustrations from life are greatly preferred.

In a useful summary of the results of her inquiry, Miss Ravenhill says of this branch of her subject: "In the grade school teaching of personal and domestic hygiene (physiology and hygiene, as it is invariably described), the best teachers lose no opportunity to inculcate ideas of duty to one's self, duty to one's neighbour, duty to one's country. They impress that the body is worthy of and well repays intelligent care; that without this good work cannot be accomplished. Children are led to see that no one has a right to injure his neighbour by his slovenly, ignorant, or filthy habits; and that the State demands that her children shall maintain her prestige by their efficiency and good health. Such practical physical morality comes within the daily observation of children; it throws a new light on the daily bath, the orderly backyard, the decent habits; it sets before them as an ideal the conduct of a self-respecting, self-controlled citizen."

II.—HIGH SCHOOLS.

Miss Ravenhill deals with the teaching of Domestic Science and Art in High Schools in the United States, in two different sections of her Report. The work done in the Public High Schools is described in the first part, dealing with State Institutions, that done in the private High Schools in the second part, in which she discusses the very large and important class of private educational institutions.

In this article the work, first of the State and then of the private High Schools, will be briefly described.

The fact that the State High Schools are coeducational, leads to the classification of Domestic Science under the head of Manual Training. While the girls are engaged in cooking, sewing, laundry work or table service, the boys devote their time to more distinctively masculine employments. Most High Schools offer several alternative courses, such as a general, classical, scientific, Latin-German, English preparatory, commercial or manual course. These courses extend over the four years of High School life, and the first two years in each are devoted to a more or less general education. Specialisation does not begin until the pupil is sixteen. "Domestic science may constitute a required subject in the general, technical or manual training course—or it may be an elective, open to all girl students." In large towns, one High School is often set apart as a manual training High School, and an increasingly large number of these include domestic science in their curricula.

The work is generally based on that already done in the Grade Schools, and includes manual work, such as design, drawing and clay modelling, and scientific work, such as the study of general chemistry, elementary physics, and bacteriology. The scientific work is both experimental and theoretical, and is usually kept in as close touch as possible with practical household problems. Care is taken to give the girls some insight into sociological and economic questions. They are "trained to realise that mere provision of food and clothing does not fulfil the housewife's duty," but that some knowledge of such subjects as sanitary house construction and combination of food ingredients are also necessary.

Such courses are found to exercise great educational influence, to supply many links between home and school life, and to give those girls whose tastes do not fit them to excel in ordinary school subjects, self-confidence, and an interest in their work, which would otherwise be lacking.

So complete a treatment of the subject is, of course, not always possible; in some cases, only cooking and sewing classes are held, and no close connection of theoretical knowledge and household practice is attempted.

Miss Ravenhill gives a detailed description of several Domestic Science courses in State High Schools.

The Brookline (Mass.) High School provides four alternative courses of study, classical, semi-classical, technical, and general. Manual training for boys, and domestic science and art for girls are obligatory in the technical and elective in the general course; zoology, physics, chemistry, and physiology are also elective subjects.

Cooking is taught in the first year, as the most congenial subject of the course, to girls of fourteen and fifteen. Chemistry and its application to household science occupy the second year, a study of the house, its construction, sanitary arrangements and care, its furnishing and decoration, the third year. The fourth year is devoted to biology, including an elementary study of bacteriology, the theory of disease causation, single home nursing, and emergency work, with a short course of invalid cookery. Great care is taken in this school to correlate domestic science subjects with the rest of the school work. "Throughout the course, visits to well-planned houses, steam laundries, chocolate works, and other factories connected with food and clothing processes, are made whenever practicable or desirable."

The course in Domestic Science at the Manual Training High School in Providence (Rhode Island) is at present available for only twenty-five students. In the first year, practical emergency and first-aid work and physics are taught; in the second, cooking and practical chemistry. In the third year, the study of food analysis and digestion; in the fourth, that of analytical chemistry and bacteriology are dealt with. The fourth year course also includes, among others, a study of home nursing, practically illustrated by demonstrations at the Rhode Island Hospital, and of hygienic and sanitary problems of home and public life. The formidable list given in the table of studies includes physics, general and analytical chemistry, chemistry of foods and physiology of digestion, physical character of minerals, botany, psychology, household sanitation, science of cooking, sewing, millinery, dressmaking, carpentry, modelling, drawing and design.

At the Hachley Manual Training High School, two courses, a long and a short, are arranged. Two years' training in the short course, which includes two lessons a week, are required for a High School diploma. The long course is intended for those who have a special taste for manual work. The course includes cookery, laundry work, table service, emergencies, home nursing, invalid cookery, home sanitation, dietaries, hand and machine sewing, elementary dressmaking, millinery, and drawing. Biology, botany, chemistry, and physics are studied in connection with the above subjects.

Physiology and hygiene are not included in the Domestic Science courses. These are not obligatory subjects in the High Schools of most States. Both the amount of time devoted to them and the methods of study vary greatly in different States, but "without exception individual laboratory work plays a prominent part in the method pursued."

At the Central High School, Detroit, the subjects studied, under the direction of Professor Louis Murbach, are air and water, bacteria and yeast, cells and tissue structure, food-stuffs, digestion, general physiology, special senses, personal hygiene, origin of diseases, and emergencies. In connection with these there are courses in physiology (1st year), botany and zoology (2nd year), general chemistry and elementary bacteriology (3rd year), and physics (4th year).

The chief aims of the course at the Peter Cooper High School, New York City, are to give each pupil some knowledge of the normal functions of the organs of his own body, and of the biological principles involved in nutrition, growth, and the relations of animals and plants. The course includes lessons on the chemistry of air and of the human body, on acid and alkaline reactions, on protoplasm, on food and digestion, on the blood, skeleton, muscles, heart and circulation, on respiration, secretion and the nervous system, and finally a few lessons on yeasts and bacteria.

In the private High Schools which exist in wealthy centres there is sometimes opposition on the part of parents to the introduction of Domestic Science and Hygiene into the curriculum. The interest taken in these subjects by the pupils, and the excellent results obtained, however, very soon silence objections. The grounds for their inclusion in the curriculum are, first, their educative value, and their power to give to "well-born and well-bred girls, whose circumstances in life relieve them from the necessities of household work, a respect for labour, a comprehension of the skilled work demanded by domestic duties, and an insight into the degree to which applied science may lighten daily household claims," and, secondly, the opportunity they give to "each pupil to discover his gifts and to start him in their effective development."

In the High School attached to the Pratt Institute, Brooklyn, "the manual training, to which six periods a week are devoted throughout the curriculum, comprises, in the first year, bench work in wood and wood-carving for boys and girls alike. In the second year it consists, for boys, of wood-turning, pattern-making and moulding; for girls, of sewing, drafting, cutting, and making garments, some study of materials being also included. In the third year boys take forging and the elements of decorative ironwork, while the girls study form, line, colour, and texture, and the outline and proportions of the human figure. They also practise costume designing (sketching hats, draperies, and gowns, half life-size), and devote some time to millinery. In the fourth year the boys attend the machine shops, learning bench-work and the use of machine tools, and the girls are instructed in domestic science, which comprises cooking, emergencies, and home nursing." Cooking is taught scientifically; each pupil is encouraged to apply the principles learnt in the study of chemistry, physics, or biology to the work; simple experiments are made, and the resulting knowledge is applied to the preparation of food. "The High School girl finds a new interest in both kitchen and laboratory when she applies her knowledge of the expansion of gases to the rising or falling of her cup-cake, and when she is led to reason out the best way of cooking vegetables from her knowledge of the degree of solubility of mineral salts." A great point is made of the careful keeping of note-books, which helps to develop scientific and methodical habits.

At the Girls' Classical High School, Indianapolis, the Household Science Department has the exclusive use of a specially constructed commodious building. The course of Domestic Science is elective and covers two years. Two one-hour lessons a week are given, of which one is theoretical and one practical. Besides the duties of the kitchen and dining-room, including marketing and cleaning, which are taught in the first year, the course covers laundry work, house sanitation, simple nursing, millinery, and dressmaking. It is considered by the pupils a privilege to be allowed to take the course, the fee for which is $10 (£2) a year.

"Speaking generally," Miss Ravenhill says, "it seemed to me that the aspects of Household Science and Art most emphasised in High School courses are the sound theoretical and scientific bases which underlie household duties, the opportunities for immediate application afforded in home life for artistic training, the increased mental and physical efficiency which follows upon a wise economy of time and an intelligent expenditure of money, and the claims of civics and patriotism upon those responsible for the rearing of the race."

With reference to the teaching of hygiene and physiology in private High Schools, Miss Ravenhill describes only the work done in the Horace Mann School, New York City. The school has three departments—a kindergarten, an elementary, and a secondary school. In the two lower departments, physiology and hygiene are taught in connection with nature study, in the High School in connection with biology. Special efforts are made to introduce in the eighth grade "a course embodying the essentials of physiology, meaning

thereby not merely the study of the human body, but strictly the essentials of both animal and plant physiology." This is believed to demonstrate better "the essential unity of animal and plant physiology than the usual course in physiology and hygiene."

This course leads on directly to biology, which is taught in the High School. Four lessons a week of forty-five minutes each are given to the subject, for one year. During the first half of the year, zoology is studied, during the second half, botany. Throughout the course great care is taken to correlate the subject with the rest of the school curriculum.

In summarising the results of her observations on the teaching of these subjects, Miss Ravenhill says: "In Physiology and Hygiene, where the boys and girls work together, continued stress is laid upon the close relationship of living conditions to health and working power. Here, as in Domestic Science, the method employed is almost exclusively that of lectures, followed by periods of laboratory work."

SCHILLER AFTER A CENTURY.[1]

IN "Schiller after a Century," Professor Robertson gives us a study, which is the outcome of a series of lectures, in which he has attempted to "define the Anglo-Saxon standpoint" towards that poet. Within the limits of half-a-dozen chapters he has tried to analyse Schiller's claims to rank as one of Germany's great national poets, and to explain and correct some of the misunderstandings which have clustered round these claims. It traces the development of Schiller's dramatic methods from *Die Raüber* and the other dramas of the "Sturm und Drang," down to *Wilhelm Tell* and the unfinished fragment of *Demetrius*. Lastly, he expresses his conclusions as to the place which Schiller seems entitled to occupy among the Germanic poets—or rather, to what extent he stands apart from them—and defines, as far as it is at present possible to do, his position among the historians, thinkers, and moralists of the eighteenth and nineteenth centuries.

Definite conclusions on the work and genius of Schiller it is, as Professor Robertson feels, difficult to attain. Those of us who judge from the outside, and even those who can claim a closer insight, have been inevitably misled, or at least biassed, by the exalted claims made on behalf of the poet, and the startling enthusiasm of the 1859 celebration. So extraordinary an outburst of popular feeling seems at first sight strange; that it was the result of several strong and distinct tendencies, Professor Robertson has clearly shown. It gave us Schiller as we know him to-day—the *Volksdichter*, the poet of freedom, the patriot, the exponent of idealism. To show how far this ideal differs from the real Schiller, how thoroughly the poet has been misconceived by his champions, is the aim of the present work.

It is comparatively easy to show how the misconceptions arose, which transformed a cosmopolitan enthusiast into a national poet; it is not so easy to reconstruct our opinions in harmony with the poet's real character and work. The fairest—the only fair course—is to put aside all second-hand knowledge of the poet, to study anew the conditions of his life, and the character of his work. The result of an attempt to do this gives us an exceedingly interesting and scholarly sketch of the development of Schiller's powers, and an analysis of the influences which manifest themselves so strikingly in the changing character of his work. Professor Robertson shows us the Schiller of the "Sturm und Drang," and emphasises the possibilities which were created by the first plays of Schiller—possibilities that the merely parochial drama of the "Sturm und Drang" might be raised into a national drama in the best sense.

Why such hopes were not realised is shown for us in the most interesting chapter of the book, that on *Don Carlos*. The immense importance of this play in the development of Schiller's powers is clearly brought out. The transition from Germanic to classical conceptions of the drama; the abandonment by Schiller of the attempt to create a specially national drama; these are convincingly set forth. The result may be a matter of regret or not; but, whatever be our personal point of view, we are compelled to recognise its vast importance.

The later dramas bear out the conclusions for which *Don Carlos* prepares us, yet leave us in part dissatisfied with them. *Wilhelm Tell*, and still more the fragment of *Demetrius*, make us doubt whether Schiller became a classicist once and for all. He does at least here emancipate himself from the stiffness of classical form. But whether he would have gone further, and come nearer a reconciliation between conflicting elements, must be pronounced doubtful.

To Schiller, as historian and philosopher, Professor Robertson devotes a shorter space. The subject is not one of so great interest, save that it amplifies opinions formed by a study of the rest of his work. Schiller, as philosopher and as historian, looks backwards. He does indeed endeavour to utilise new methods, inasmuch as he adopted and applied the deductive method of Kant. But he used it in the service of the old national traditions; the spirit of his work is that of the older thinkers.

The conclusion to which the whole brings us is that Schiller belonged above all to the century which gave him birth. He did indeed "think the thoughts of his age" with peculiar intensity, and it is necessary to study him in close connection with his surroundings before we can gain an adequate idea of his place in literature. Professor Robertson seems to use a rather forced historical parallel when he makes the brothers of *Die Raüber*—"the one all heart, the other crafty, designing intellect"—into a personification of "the forces which clashed together at the French Revolution." The analogy seems hardly to apply to the multifarious and complex ideas whose collision brought revolution. It does injustice to the despots of the old régime, whose distinguishing characteristics were neither intellect nor guile, and it misunderstands the new forces.

The book is, however, successful in proving its main contention. It forms a valuable study of the development of Schiller, and one which may be gratefully received by those who have, perhaps, neither the leisure nor the desire to read exhaustively in a rather bewildering period of literary history.

It should certainly explain away many misconceptions of the position and work of Schiller; and may lead us, if not exactly to its own conclusions, at least to some definite and less superficial views than those we have hitherto been content to accept.

[1] John S. Robertson. W. Blackwood & Sons.

THE EARLIEST BEGINNINGS OF EDUCATION.

THE history of education has in most books on theory commenced with the study of the system of the ancient Greeks, but as a result of careful and intelligent Oriental research it has been proved that we can trace the science of pedagogy far back into antiquity. Prejudice has at last been broken down, and recent discoveries show conclusively that the first chapters of Western civilisation require to be based upon materials gathered from the tombs and temples of the land of the Nile, and the buried libraries of Chaldea. There is in reality no broken link in the chain of culture which binds East to West, and there is much in Greek art and mythology which has been influenced, if not initiated, by the sages of Memphis and Babylon. It is no longer a matter of tradition that the learning and wisdom of the sages of Egypt and Chaldea was of a pronounced character, for both of these ancient lands were essentially "Scribe Lands," where the true ruler of the nation was the man of letters. If a man wished to hold a position in either of these lands, he must be a "scribe," and therefore educated, so that a system of training, combined with a science of pedagogy, may be inferred to have existed. Such titles as those of "scribe," "sacred scribe," "royal scribe," are found in records existing from the earliest dynastic times, and the perfection of the writing and grammatical style of inscription, some four thousand years before our era, shows that education in Egypt was even then far advanced. What is probably the earliest specimen of Egyptian hieroglyphic writing known is that from El Amrah, near Abydos, now to be seen in the British Museum, where also may be inspected the lesson-books used in the schools of Thebes and Memphis, the selections used for reading and writing, and even the kinds of pens, ink, and paper used.

There do not appear to have been any elementary public schools in Egypt, their place being supplied by private tutors, or "scribes," who took pupils. Education began early in Egypt, even before the child was free from the mother's control, and in this respect it resembled the system advocated by Comenius, that education must begin on the mother's knee. In this respect, too, the Egyptians differed from the Greeks, for while the child was sent to school to be taught in "the writings," the mother was busy each day near the teacher "bringing bread and drink from her house." The child first learned his alphabet by copying the signs over and over again, and having them corrected by the master. The method of teaching consisted in the use of an oblong board covered with plaster, on which were written a number of extracts, and short sentences from standard literary works of the period. It was perforated at one end, so that it could be hung on the wall, like the alphabet, figure and multiplication-table boards formerly used in English dame-schools. The importance of the "scribe's" position was continually being dinned into the pupil's ears, and we frequently meet with an adage like the following: "One has only to be a scribe, for the scribe takes the lead of all." One literary work which was much used in the schools was a "Poem in Praise of Learning," which was written on papyrus, and may now be seen in the British Museum. In this the author waxes eloquent on the superiority of the "scribe's" position to that of any others, and by way of contrast, adds: "I never saw a blacksmith sent on a mission, or a metal-worker as an envoy." In Egypt, where caste was supreme, education naturally was approximated to the position which the child's parents occupied in life. Thus the son of a "sacred scribe" would study sacred literature, the son of a government official would be trained as for the civil service, and the merchant's child for commercial life.

In the educational literature of Egypt we find exercises suited to all occupations, many of which were revised and corrected by the master. These embraced extracts from hymns, requests for leave of absence, letters both complimentary and commercial, and lists of bills for various objects with the prices attached in the form of an invoice. According to the various scholastic departments in which the youth was educated, the paths to the highest positions were open to him, for all was open to the "scribe." Geography does not seem to have been taught to any great extent as in the modern system, for, like the Chaldeans and the Greeks, the Egyptians had no maps or charts; but careful attention was paid to the grouping of nations and the products of various lands. As an aid to geography teaching there existed a plastered board, on which were written a number of names of various peoples, and described as "writing the names of the Keftiu," who are understood to have been the nations of the Eastern Mediterranean, the coasts of Asia Minor, and the adjacent islands, including Crete and Cyprus. This work must have been compiled about 1300 B.C., when there was a close intercourse between Egypt and these regions. In a country where the State script was a hieroglyphic system, it was necessary that the successful "scribe" should be able to draw, and so we have many examples of elementary instruction in the arts of both drawing and sculpture. The boards, or slabs, were divided into squares, as in scale drawing, and according to these the student drew, under his master's instructions. This method was carried out in the working drawings for a statue of one of the Egyptian kings, by the side of which were trial sketches of hieroglyphics, and also in a fine scale model of a head. Another conspicuous trial piece was one in which was depicted the god with the mask, the patron of laughter and dancing, from whom the Greeks derived the "Mask of Comedy," while on the other side the student sculptor had been trying his hand at bird forms, at all times very difficult.

It will thus be seen how much may be learned from studying the pedagogy of Egypt, and how in this way a new chapter has been added to the history of education. Yet our limit is not reached, for the discoveries in Babylonia carry us even further back, and reveal with even fuller detail the methods of the oldest educational system in the world. That the *ideal* which its authors set before them was a high one may be gathered from a very interesting passage in the "Maxims of the Scribe Ani," who, when dealing with the question of filial respect for the mother, wrote of the child: "When thou didst grow in strength, and no disgust of thy untidiness caused her to say, 'What shall I do?' thou wast sent to school." Again, in the "Poem in Praise of Learning," we find it written: "I will cause thee to love literature as thy mother; I will make its beauties to be apparent to thee. It is greater than honours or dignities of any kind. It is not a mere word on earth. He who begins to benefit from it as a child shall be prosperous in his affairs; they shall send him on embassies."

HOW TO KEEP WELL.[1]

A REVIEW.

THE writer of this "text-book of Physiology and Hygiene for the Lower Grades of Schools" evidently has the interests of boys and girls well at heart. The language is simple, and may easily be understood, except, of course, where technical words occur, which must necessarily be explained. From the point at which the body is compared to a steam-engine —a well-known comparison—to that which treats on First Aid to the Injured, everything is thoroughly of interest and technically correct. The author, however, intersperses opinions of his own with no sparing pen; and it is this feature of the book which has prompted us to give it a special review. Our attention is particularly drawn to his remarks on alcohol and tobacco—especially tobacco. We are indeed made to wonder whether he has tasted the joys of a well-seasoned briar or of a high-brand cigar. Not that we encourage smoking to excess in manhood or smoking at all in youth. Far from it. But when the book teems with reference to the "fragrant weed" we are bound naturally to pause, consider, and reflect; we are equally bound, also, to put the views before our gentlemen readers, for we have a tender regard for their weal and their strength. According to our author, we smokers must be in a particularly parlous state. Listen: "As the bones grow they need material for building them up. If the blood is made poor, or poisoned with alcohol or tobacco, the bones are deprived of the matter they need for their growth. Physicians testify that tobacco tends to stunt the growth of the bones." We do heartily rejoice at the word "growth," for we are full-grown and are strong and muscular. We need fear no harm on that score when the coming holidays are upon us, and we lounge on seaside sands, or walk on moorland, or rest on mountain top. We are glad we are not boys, for although many boys *are* dwarfing their bodies as well as their minds by smoking cigarettes, generally of a cheap and pernicious sort, and cannot afford to form any habit that will interfere with their growth, we take the flattering unction to our souls that we are men, and have done with growing-pains, if, indeed, we do now and then get a rack of their kindred ache—tiredness. We are bound to say that, as far as the muscles are concerned, "tobacco causes weakness and unsteadiness," for we remember that when we trained for the "mile" or the "hurdle" we were perforce robbed of our pipes. But when the sports were over, didn't we come back to the "whiff" with delight? We are speaking, of course, as moderate smokers, and perhaps the word moderate is elastic enough in its meaning to signify just as much as we can do with without feeling "a bit off." In connection with muscle development it is significant, we admit, that whereas a well-equipped gymnasium contains "suitable bathing facilities and ample dressing-rooms," its other conveniences do not include a smoke room. Under "Foods of the Body" no mention is made of the use of tobacco, not even in the form of a vegetable food, though, if we are to believe Salvation Yeo, and he knew a thing or two, "tobacco is the hungry man's food and the sick man's cordial." That must have been his experience many a time, and we have heard smokers say that they would sooner go without their breakfast than their pipe. "There is no herb like tobacco under the canopy of Heaven."

What a pity for the author's sake that he cannot drag tobacco somewhere into the chapter on Drinks. Perhaps that is an oversight. Any way, Dr. Blaisdell makes up for the omission when he comes to the effect of tobacco on the skin. "Tobacco gives the skin a peculiar dry and sallow look. If a confirmed tobacco-user be put in a warm bath"—we wonder, by-the-bye, who is going to make the experiment. Would the tobacco-user resist, or would he passively submit? To continue—"the odour of the tobacco may be easily perceived in the room when he comes out. This is because the pores of his skin become saturated with tobacco. But we need not put the tobacco-user into a bath to discover this." This is evidently an alternative to the resister. "The odour of tobacco is constantly passing out of his skin through his clothes until they become so filled with it that we can smell it as we pass him on the street. The smoker, however, may be entirely unconscious of this. His senses may be so blunted that he fails to notice the odours that make him offensive to many people with whom he has to do." Here again we are grateful for the little word *may*, and in our gratitude we will try and forget the illogical statement that when tobacco smoke passes *through* the clothes it fills them. But, how like ye this, ye smokers of B. D. V.? "Tobacco has the power, through its effect upon the brain and nerves, to deaden the user's sense of politeness and make him careless of the rights of others." We must conclude this quotation or it will be more ridiculous than the author intends it to be. He goes on: "All have a right to breathe pure air. The smoker puffs his tobacco smoke into the faces of people on the steam-cars and ferries, in waiting-rooms, hotels, and places of amusement, regardless of the fact that it may be very disagreeable. The tobacco-chewer, selfishly thinking of no one but himself, soils the floor, stairs, side-walks, and even stores and other objects that come within the range of his disgusting habit. This is the whole story in a nutshell: no person who wishes to keep strong and vigorous, or is ambitious to succeed in life and to make the most of his abilities, should smoke or use tobacco in any form." Here the worthy doctor is no longer speaking to children, for the words, "keep strong and vigorous," must necessarily refer to grown-ups. He must also be thinking of the American chewer and expectorator, who, to quote Max O'Rell, can expectorate ten yards without making a miss. The disgusting habit of chewing a "plug" is happily confined in this country to particular classes of men. These are not the teaching profession. Our gratitude once more.

American like, Dr. Blaisdell quotes on this page (193) from one of his own books, and declares that "the honors of the great schools, academies, and colleges are very largely taken by the abstainers from tobacco." This "very largely" fact did not, however, prevent our very greatest thinker from being a very heavy smoker. This "very largely" fact did not prevent Germany's very ablest warrior from smoking cigars in a chain.

When speaking of the "five gateways of knowledge" —wisely so called—of touch, taste, smell, hearing, and sight, tobacco is not lost sight of, for "when a person has benumbed his brain with alcohol he may fall and bruise himself without complaining of pain. The long

[1] *How to Keep Well*, by Albert F. Blaisdell, M.D. Ginn & Co.: Boston, New York, Chicago, and London.

continued use of alcohol and tobacco, especially tobacco, often results in a disease of the eyes, which may seriously impair vision." *Often* and *may!*

We look in vain under the heading:—"How our bodies may defend themselves against germs of disease" for tobacco. Does the doctor not know that the safest place in a railway train from bacteria (where bacteria most do congregate), is the smoking-compartment? It is, indeed, the safest place from the modest flea. Or, has the doctor to complete his education yet to learn that smokers are, though not altogether immune from taking disease or being seized on by the little insect, the last to suffer an attack?

Joking apart, the book on the whole is a wholesome addition to our school literature. Like most of the American school books it is well printed, illustrated, and published. It contains the usual American blunders of English spelling, but in that particular what matters it? We hope many of our readers will buy the book and use it with their children. It is the excessive use of tobacco we deprecate and discourage, and perhaps this is what the doctor is aiming at. We who have learnt the art of smoking and practise it with moderation, need fear no harm on that score. There is no need for a moderate smoker to take a journey to Algeria or anywhere else. Intemperate habits are as harmful as intemperate language.

UNIVERSITY OF OXFORD.

DELEGACY FOR THE EXTENSION OF TEACHING.

We desire to draw the attention of our readers to the programme which has now been issued for the forthcoming meeting of University Extension students, to be held at Oxford in August. The programme is not only an exceedingly attractive one, but has obviously been most carefully devised by the Delegacy from the point of view of educational efficiency. The general scheme of lectures has been designed to illustrate the History, Literature, Fine Art, and Architecture of the period of the Renaissance and the Reformation, and there will also be a special section devoted to Natural Science and Social Economics, and special classes in the Theory and Practice of Teaching, and in the English Language—the last designed primarily for foreigners. The meeting will open on August 4, and will close on August 28, and will be divided into two parts for the convenience of those who cannot stay the whole time. The inaugural meeting is to be held under the presidency of the Vice-Chancellor, and an address is to be given by Professor James Stuart of Cambridge, the real pioneer of University Extension.

The lectures in the Natural Science Section will be devoted to an attempt to set forth the Scientific Method, and to illustrate its application to special branches of study and scientific work.

It is proposed that the scheme should comprise the following lectures:—

I. *General Introductory Lectures.*—(*a*) On the Scientific Method as an Instrument of Thought; (*b*) On the Scientific Method of Investigation.

II. *Special Lectures* to illustrate the applications of the Scientific Method in some of the following branches of Experimental Science.—N.B. In all these subjects the lectures would be directed to show—(*a*) the extent to which the general conceptions of the particular science have been developed by the use of the scientific method; (*b*) the way in which the method is used in the experimental investigation of some one group of phenomena; and how such an investigation may contribute to the elaboration of the scientific method itself.

The special lectures suggested are as follows:—

(1) *Physics.*—(*a*) Modern conceptions of matter; (*b*) The method of investigating electrical phenomena.

(2) *Chemistry.*—(*a*) The Elements; (*b*) The method of investigating Explosives.

(3) *Zoology.*—(*a*) Variation and Heredity; (*b*) Some Biological Problem, such as the Growth of Corals.

(4) *Botany.*—(*a*) A General Survey; (*b*) A special botanical research.

(5) *Physiology.*—(*a*) A General Survey; (*b*) The Method used for investigating a particular physiological problem.

(6) *Psycho-Physics.*—(*a*) Methods and Aims; (*b*) A special investigation.

III. In addition it is suggested that a group of subjects might be treated similarly, in which the characteristic feature is not direct experimental investigation, but rather the selection of typical data and the generalisations drawn from the study of these.

(1) *Astronomy.*—Illustrations of Astronomical Method.

(2) *Geology.*—Inductions from a Fragmentary Series.

(3) *Anthropology.*—The Conception of Evolution as applied to Human Handiwork.

(4) *Archaeology.*—Crucial Instances; or perhaps "Methods and Aims in Archaeology."

(5) The Nature of Historical Evidence.

It is further intended that this course should lead up to a comparison between the scientific conceptions of the present day and those of the seventeenth century, which will be the special subject of the Summer Meeting of 1907.

COLLEGE OF PRECEPTORS.

CERTIFICATE AND LOWER FORMS EXAMINATIONS.

SPECIAL SUBJECTS FOR MIDSUMMER AND CHRISTMAS, 1906.

The following are some of the *special* subjects for the Examinations to be held at Midsummer and Christmas, 1906. The complete List of alternative subjects will be published in January next:—

English.—First Class.—Set Books: (*a*) Shakespeare's "Henry V."; (*b*) Shakespeare's "The Tempest."

Second Class.—Set Books: (*a*) Shakespeare's "Henry V." Acts i., ii., and iii.; (*b*) Shakespeare's "The Tempest," Acts i., ii., and iii.; (*c*) Scott's "Lay of the Last Minstrel."

Third Class.—Set Books: (*a*) Scott's "Lay of the Last Minstrel," Introduction and Cantos i., ii., and iii.; (*b*) Macaulay's "Horatius," and "Battle of Lake Regillus."

Lower Forms.—Macaulay's "Battle of Lake Regillus." The following stanzas to be learnt by heart:—xx.–xxxiv. (commencing "But north looked the Dictator," ending "Before the ranks of Rome").

History.—First Class.—(*a*) 1066–1399; (*b*) 1603–1714; (*c*) 1815–1871.

Second Class.—(*a*) 1066–1485; (*b*) 1485–1688 (*c*) 1688–1830.

Third Class.—(*a*) 1066–1485; (*b*) 1485–1688; (*c*) 1688–1815.

Lower Forms.—(*a*) 1066–1485; (*b*) 1485–1688; (*c*) 1688–1815.

Geography.—Second Class.—Eastern Asia (E. of longitude 100), including the Islands.

Third Class.—Europe, especially British Isles.

Lower Forms.—British Isles.

Latin.—First Class.—(*a*) Caesar, *Gallic War*, Books i. and ii.; (*b*) Virgil, *Aeneid*, Book i.; (*c*) Horace, *Odes*, Book i.

Second Class.—(*a*) Caesar, *Gallic War*, Book i. (*b*) Virgil, *Aeneid*, Book i., 1–493.

Third Class.—(*a*) Eutropius, Books i. and ii.; (*b*) "Nepos' Selected Lives," by J. B. Allen (*Clarendon Press*).

Greek.—First Class.—(*a*) Euripides, *Alcestes*, 1–740, omitting lyric parts; (*b*) Xenophon, *Anabasis*, Book ii.

Second Class.—Xenophon, *Anabasis*, Book ii., Chap. 1–4.

Hebrew.—First Class.—1 Kings xxi. to 2 Kings x.

Second Class.—Exodus vii.–xiii.

Scripture.—First Class.—(*a*) Joshua i.–xiv., xxiii., xxiv., Judges i.–xviii.; (*b*) St. Luke; (*c*) Acts i.–xvi.; (*d*) Acts xiii. to end.

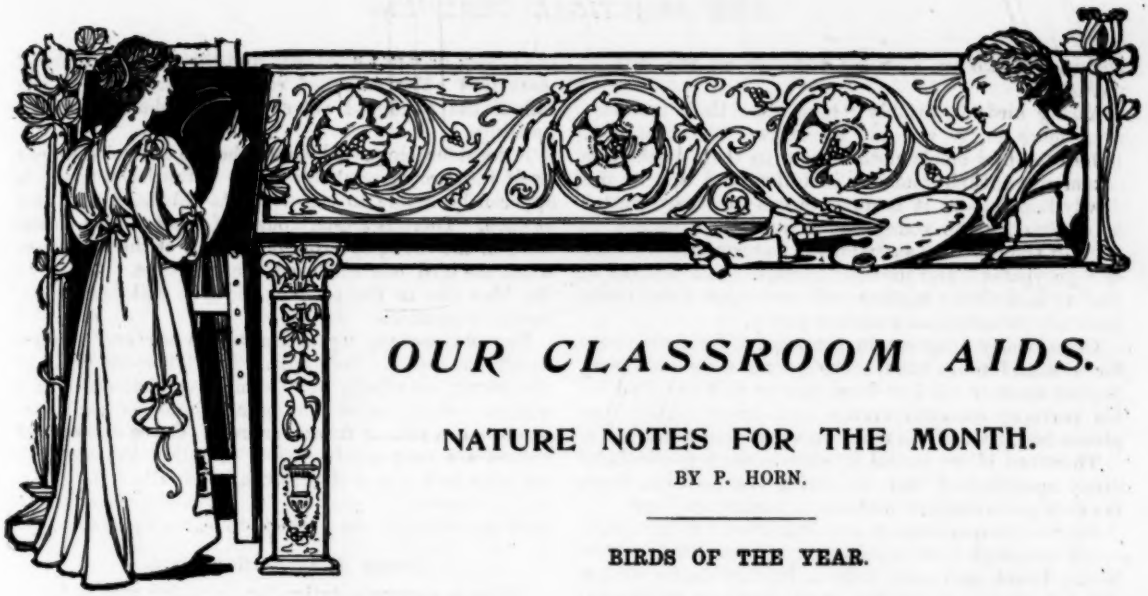
Second Class.—(*a*) Joshua i.–xiv., xxiii., xxiv., Judges i.–ix.; (*b*) St. Luke; (*c*) Acts i–xvi.; (*d*) Acts xiii. to end.

Third Class.—(*a*) Joshua i.–xiv., xxiii., xxiv.; (*b*) St. Luke vi. to end.

Lower Forms.—(*a*) Joshua i.–xiv., xxiii., xxiv.; (*b*) St. Luke vi. to end.

C. R. HODGSON, B.A.,
Secretary.

June, 1905.



OUR CLASSROOM AIDS.

NATURE NOTES FOR THE MONTH.

BY P. HORN.

BIRDS OF THE YEAR.

The Decline of the Breeding Season.

WITH the coming of August the breeding season of the birds is, practically speaking, at an end. The schoolboy now finds bird-nesting to be an extremely unprofitable sport.

Nature seldom works in an abrupt fashion. For a long time past a great change has gradually been coming over the bird life of the countryside, and those readers who make a practice of getting away from town at every opportunity, must assuredly have noted the signs.

The breeding season reached its maximum of intensity in mid-June. At that period the whole bird kingdom, residential and migratory, was apparently occupied in duties incumbent on the propagation of their respective species; nests, eggs, and young in all stages of development were plentiful, and it was impossible to walk innocently along a stretch of hedgerow without raising the indignation of numerous feathered creatures.

Most significant of all the breeding signs were the love songs of the male birds. Nightingale, cuckoo, thrush, and blackbird, when not actively engaged in tending their young or driving off unwelcome visitors, vied with each other in proclaiming aloud with melodious voices the chief purpose of their existence, and the chorus of English bird music was complete.

About hay-time the turning point was reached, and the beginning of the end became apparent.

First the nightingale, never by any means a conspicuous bird to the observer's eye, relapsed into the obscurity of silence.

The cuckoo, harbinger of spring, was the next defaulter, and with the gradual extinction of the motive which actuates the song, each successive week was signalised by the disappearance of one or more familiar summer voices.

At present the only reliable and consistent songsters, if they may be so dignified by the term, are the sentinel yellowhammer chanting his monotonous jumble of ascending notes by the wayside, and his bulky cousin the wheezy corn-bunting; and very shortly even these laggards will cease to reiterate their wearysome jingle in the sultry stillness of the "silent month."

In the autumn a few young males, stirred by the freshness of the early morning, may essay amatory passages; the southward-bound chiffchaff, too, occasionally breaks forth into his old spring song, but we shall not hear the full orchestra again this year.

Coincident with the vocal cessation dies much of the old spirit of contention. To-day we see again the unwonted spectacle of the various finches fraternising, as they plunder the harvest fields; the scattered starling parties grow perceptibly larger day by day.

There is no desire to quarrel, save in the vulgar interests of self. Sexual instinct is dead for the time being; the breeding season has passed, and the wild birds, released from their arduous parental duties, are entering a period of quietude wherein they unconsciously prepare for the hardships of coming winter.

On the whole, the year 1905 has been merciful to the young birds. The cold snap which again, as two years ago, worked havoc in the Midland orchards at the end of May, was responsible for many unproductive eggs, and the long spell of spring drought put the thrush and other soft-billed birds to much inconvenience; but in spite of these drawbacks, the past spring and summer can compare favourably with the previous season.

A goodly percentage of the birds to be seen in the summer holidays will bear the juvenile stamp.

The question is, how are we to distinguish the rising generation from their elders?

General Characteristics of Birds of the Year.

If we are acquainted with the old birds, the recognition of the young after they have been cast adrift in the world, is much simplified, for, in the ordinary course of nature, they inherit the form and habits of their progenitors.

As a case in point, take the young blackbird.

Clad though he be in russet brown garb, the grace and abandon of the characteristic tail swing of the alighting bird is unmistakable, and those who have watched the old male gathering worms can never confuse the leisurely hop of his offspring with the bustling walk of the similarly dusky young starling when by

chance the two are foraging together on the distant pasture.

Young birds invariably "take after their mother," even more so, if we may so express the condition. Before the first moult clothes them in their distinctive sexual dress, their plumage is duller than that of the dowdy female, and it is an extremely difficult matter to distinguish the young males from their sisters, in spite of the contrary assertions of enterprising vendors of "greypates" and juvenile linnets. The wisdom of Nature is obvious; mother and young are more liable to escape detection at a critical period.

Occasionally they retain portions of infantile dress for a considerable time. The young male blackbird, paying court to his first love, can be distinguished by his partially coloured orange and brown beak; the pinion feathers also show brown when held to the light.

Therefore if we should by chance see a particularly dingy specimen of blue tit during the holidays, there is every probability of its being a bird of the year.

On closer acquaintance there is another infallible sign.

All nestlings have notoriously wide mouths. Their beaks, broad and soft, have a fold of fleshy yellow skin at the angle of the gape, which permits the hungry youngster to present a good receptory orifice. Ultimately the beak hardens, but the quaint yellow crease remains at the corner of the mouth until it shrinks beneath the growing feathers. A great deal may be learned by rearing a young thrush, though I am no advocate of the process for incompetent persons.

I have often been struck by the extreme playfulness of young birds, starlings in particular. One of the latter birds, reared by hand, was great chums with a young thrush. When the pair were liberated for their usual morning bath, the starling took great delight in sidling up behind his friend, and suddenly pulling his tail. The thrush was always the first to begin ablutions, but the designing starling invariably ousted him by his artful tactics. The antics of this pair would fill a column; but I am digressing.

In the wild bird, especially the robin, the same playful spirit is noticeable.

The general demeanour of the young bird is different from that of the hardened and world-wise adult. Until they have learned to include man in their list of natural enemies they evince no desire to shun his presence.

The murderous cat is aware of this state of blissful ignorance, and levies toll accordingly. Suburbanites note—now is the time to gain the confidence of the feathered inhabitants of the garden.

Who has not noticed the curious contrast between the piping treble of childhood and the resonant tones of maturity? The practised ear can usually detect the call of the young—I refer to independent birds, not nestlings.

A considerable period elapses before the voice shapes itself into proper semblance; the potential songster is apparently unable to throw off its babyhood notes all at once. There is a querulous half-hearted ring in the chirp of the young sparrow, or the caw of the rook, even when the bird has mastered the call note. Listen to the blue tits in the orchard and you will hear many husky intonations.

The old saying, "practice makes perfect," applies equally as well to the birds. The laborious flight of the young, amusingly calls to mind the human novice, who, in cycling or swimming one hundred yards, expends half a mile of frantic energy. Grace and ease of motion are only acquired with practice. As we shall see later, in the case of the duck and swallow, the young bird is sometimes placed at a slight degree of disadvantage, owing to the incompleteness of apparatus.

Young Birds Particularised.

Below is a representative list, in which will be found the characteristics of many of the birds likely to be met with shortly.

Sparrow.—Similar to female but paler underneath. The chestnut of the back is not nearly so rich. The secondary flight feathers are usually paler, approaching to transparency. Feeble chirrup.

Starling.—Were it not for the manner in which the two fraternise together, we might possibly mistake the brown young, with its pale throat and underparts, for a totally different bird.

Two skins in my possession, both from the same locality, are different in tint. In the one, warm brown, in the other ashy brown, predominates.

Mr. Frank Finn, with whom I was discussing the matter a short time ago, has noticed the same peculiarity, and suggests two varieties of plumage. It would be interesting to have further data.

Towards the middle of August the bird begins the gradual process of moult, and we have an extremely interesting phase of plumage. The brown coat of childhood is interspersed here and there with patches of the black pale-tipped feathers which characterise the ordinary adult winter plumage. The head is the last portion to moult, consequently at this season we often see the antithesis of the "old head on young shoulders."

Blackbird.—Predominating colour brown, similar to female, but ruddy-brown or buff where the female is

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STAGE V.

NELSON'S NEW DRAWING COURSE

By J. VAUGHAN

Director of Manual Training, Glasgow School Board

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grey. Back slightly speckled; breast mottled buff and black. Walk quietly among the gooseberry bushes in the early morning, and you will have ample opportunity to compare old and young.

Thrush.—Back dingy brown (not warm olive as adult's), speckled with yellowish spots.

Robin. — Somewhat similar to young blackbird; speckled breast, with not a particle of robin red. Easily recognised by the familiar bowing "click," and accompanying flirt of tail. At the end of August the red waistcoat begins to appear.

Redstart.—Similar to robin, but shivering chestnut tail.

Spotted Flycatcher.—The young are greyer and more hoary-looking than the adults. They have a true spotted breast (the old one has not), and the plumage is never so sleek. Flycatcher tactics in brief—coign of vantage, sudden flight, ærial eccentricities, return.

Wild Duck.—Brown, unable to fly. "Flapper shooting" is significant.

Blue Tit.—Adult is brilliant blue-green and yellow, with white cheeks. Young are dingy yellow and green, with yellow cheeks. The husky call-note lacks metallic ring.

Goldfinch.—Young and old now band together in merry twittering parties to visit the ripening thistles. The young, known to the dealers as "greypates," have none of the characteristic red on the head.

Rook.—Nostrils covered with bristles, which disappear in the ensuing spring, leaving the face white and bare.

Swallow.—Outer rectrices (tail feathers) short. Compare tails of old and young as they cluster on the telegraph wires.

Wood-pigeon.—No gloss on breast. White neck-patches absent.

Moorhen.—Adults black, with red foreheads. Young brown, no red.

As I predicted last month, the abundance of hibernated female Small Tortoiseshell butterflies has resulted in a corresponding plentitude of larvæ.

On Whit Monday I found no less than six separate batches in one little nettle bed, and a bedraggled female was engaged in founding a seventh colony.

On the same day, Drinkers, Tigers, and Gold-tails were secured for the breeding cages at Stepney. *Fortunately* all have since pupated. Readers who followed out the March paper will probably understand the significance of the italicised adverb.

NOTES OF LESSONS ON SHELLS.

Class.—Although these lessons are intended primarily for the upper standards, the subject is one that presents points of interest to every child, so that some parts of the lessons, if given in very simple language, would be found suitable for younger children.

Time.—Two lessons of about thirty minutes each; if possible one should be given before the holidays and one after.

Object.—To show the children some of the beauties of these works of Nature, and to provide those who are fortunate enough to visit the seaside during their holidays with a source of intellectual recreation. All children delight in gathering shells, but without some preparatory training they waste their energy in collecting large bundles of shells whose ultimate fate is to be cast away when the small collector is too tired to carry them any further. But had the child known how to exercise a little discretion in the selection of its shells, it might gather enough good specimens to form the nucleus of an interesting collection that would prove an abiding pleasure.

Step I. Preparation.—As we have already said, the subject should be dealt with in two lessons, the first being merely preparatory; in this lesson the teacher will endeavour first to interest the children in the subject and then to give them a few practical hints in collecting.

1. *What is a Shell?*—In former lessons we have considered some of the means of defence with which animals are provided, such as inaccessible lairs, speed of foot, imitation, mimicry, &c., but we now have a fresh example. The shell is a very obvious and primitive means of defence with which Nature has supplied the most helpless members of her family, the armour of the knight of old being merely a clumsy imitation of a shell.

2. *Crustaceous and Testaceous Shells.*—If asked to give examples of shell-fish the children will probably name the crab, lobster, oyster, whelk, &c., but these differ very materially and give us two distinct classes of shells. The most obvious difference is that the shells of the crab and lobster are jointed and follow the general form of the body, so that they are often spoken of as external skeletons, a term which cannot be applied to the shell of the oyster or whelk. Another important difference is the manner in which the shell keeps pace with the growing animal; in the case of crabs and lobsters, the shell is cast when it is too small for its owner, the animal going into retirement until the new shell hardens. These animals are said to be Crustaceous, a long word which means possessing an outer coat or "crust." Testaceous fish, on the other hand, do not cast their shells, but add fresh material to the rim to increase the size; look at a mussel shell and you will notice that it is composed of a number of rings, each of which has been added by the mussel as he found he required a larger shell.

3. *Of what are Shells made?*—Shells are composed almost entirely of chalk held together by a small quantity of animal matter. The material for building up the shell is obtained from the sea-water, and this explains the reason why, in spite of the fact that chalk is the substance that appears most largely in solution in river water, there is only a slight trace of it in the sea. The structure of the shell may be either crystalline or granular; the former, of which the cowry is a good example, are more or less transparent when held against the light, and are far more delicate in appearance than the granular or concretionary shells such as the oyster shell.

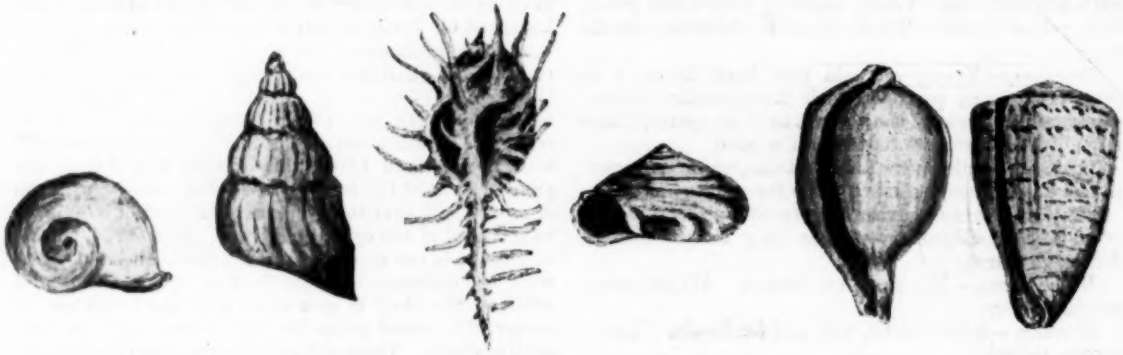
4. *The Beauty of Shells.*—Among the shells are to be found some of the most beautiful objects in Nature, rivalling the flowers in the beauty of their form and the richness of their hue—

> "The rainbow-tinted shell, which lies
> Miles deep at bottom of the sea, hath all
> Colours of skies and flowers and gems and plants."

Sometimes the colours are pale and delicate like the first flush of dawn, sometimes intense and vivid as a rainbow; in some the colour is distributed all over the

shell, in others it lies in patches either irregular or forming patterns. All this wealth of colour is produced by the animals that inhabit the shells; their necks are furnished with tiny pores which secrete the colouring matter and pour it into the substance of the shell as it builds it up. If it builds faster than it secretes colouring matter then the colour will lie in bands or patches, the pale parts marking periods of exhaustion. The shapes of shells too are most diverse and wonderful, and since the shape is largely relied on in the classification, it is even more interesting from a collector's point of view than the colour. Here we have a hollow cup or a simple tube, here a twisted cone or a convoluted circle, this has a curving lip like a lily, that a rim like a silver chalice.

5. *Collecting Shells.*—In collecting shells, do not gather them up in a haphazard sort of way, but have a reason for keeping each specimen. Some will be retained for the beauty of their colour or shape, and in these cases half-a-dozen similar specimens would not be too many; but the humbler varieties must not be quite neglected, although in these cases one or two will be sufficient. In every case try to get the finest specimens you possibly can, and above all things be constantly on the watch for fresh varieties, so that your collection may be as complete as possible. The best time for gathering shells is after rough weather, and the best place to hunt for perfect specimens is among masses of sea-weed, which protect the delicate shells from the force of the waves. At the end of the day all the shells that have been collected should be soaked in very hot water to wash off the dirt and salt, and all traces of the inhabitant should be carefully removed. When the shells are dry many of them will appear much duller than before, but the brilliancy of colour can be restored by painting them with a weak solution of gum-arabic.



1 2 3 4 5 6

Step II. Presentation.—When school re-assembles the treasures should be brought for examination and arrangement.

Classification of Shells.—Owing to the almost countless number of varieties of shells, their complete classification is far too complicated to be attempted with children; the most that can be done is a simple classification on obvious characteristics which can be identified by the children, but which will serve as a starting-point for those who wish to follow up this interesting study.

Three Great Classes.—Shells fall naturally into three great divisions according to whether they are composed of a single piece like the whelk-shell, of two parts like the oyster-shell, or of more than two pieces like the barnacles. These classes are known respectively as Univalves, Bivalves, and Multivalves.

Univalves.—This class includes an immense number of varieties, but the following is a fairly simple classification:—

1. *Twisted Shells.*—The most common example is the well-known Periwinkle, which is found in such large numbers clinging to the rocks; more aristocratic members of the family are the Wentle-traps—the Royal Staircase Wentle-trap being very rare and expensive.

2. *Trumpet Shells.*—These are represented on our shores by the Whelks and Conches. The Common Whelk is well known, but there are two other varieties to be found—the Stone Whelk and the Net Whelk, the latter being beautifully marked with a network of fine lines. The larger members of this family found in warmer seas fully justify their title, for they are used by the natives of the Eastern Archipelago as trumpets.

3. *Rock Shells.*—These resemble the former class, but are distinguished by their rough and wrinkled forms. Many varieties are to be found on our coast, the most common being the Humble Murex, so called possibly to distinguish it from the Royal Murex of the South Pacific, which is one of the most gorgeous shells known.

4. *Top Shells.*—These are named from their resemblance to a boy's top. Of the British shells, the smallest is the Spotted Trochus or Pepper and Salt Shell, while the Red Trochus is perhaps the most beautiful, glistening in a shallow pool like pearl studded with rubies.

5. *China Shells.*—This class is remarkable for the high polish they bear, which gives them the appearance of china or porcelain. The most common are the Cowries; the beautiful pink Flesh-coloured Cowry, and the pale red Nun Cowry with its six black spots, are well known on our shores. The Money Cowry of the Guinea Coast was used by the natives for coins; the Spotted or Leopard Cowry is frequently met with as a chimney ornament.

6. *Cones.*—Although not so common in this country, this class includes some of the most beautiful and valuable shells. The Lettered Cone, which appears to be marked with Hebrew characters, the Vice-Admiral and the Guinea Admiral are beautiful shells, which will fetch from 5 to 20 guineas.

Bivalves.—These are easily divided into two classes by the nature of their edges, Toothed and Plain.

1. *Toothed Edge.*—The oyster, which is the king of bivalves living in a palace of pearl, belongs to this class, although the toothed nature of the edge is not so clearly seen in the edible oyster as in some of the other

varieties, such as the Cock's-comb Oyster. The Scallop and the Cockle furnish more striking examples of this class.

2. *Plain Edge.*—In this class would be placed the Mussel Shell and the Razor Shell and those remarkable

1 2

creatures that are able to bore their way into the hardest rock, such as the Prickly Pidduck.

Multivalves.—These are only a small class, the chief members being the Chitons, found adhering to the stones near low water mark, and the Barnacles, which cling to drift-wood, ship bottoms, &c.

Step III. Association.—Such a long train of associations is connected with the subject of shells that space will only allow the mention of two or three.

Shells have been termed "the Medals of Creation," for they are enduring records that mark some of the mighty changes that have taken place on the surface of the globe. So, too, the progress of civilisation may be said to be marked by shells. The savage warrior tipped his spear with pieces of shell or used them to decorate his scanty costume, the dawn of civilisation was marked by the use of shells for coins, whilst the part played by shells in the political life of a highly polished nation like the Greeks is still shown by the words "testify" and "ostracise," which remind us of the times when the Athenians recorded their votes on shells. The beauty of the shell has often supplied the poets with a theme, whilst its shape is said to have suggested the first musical instrument—

> "The lute was first devised
> In imitation of a tortoise' back,
> Whose sinews, parchèd by Apollo's beams,
> Echoed about the concave of the shell."

Step IV. Formulation.—Shells are made of chalk; either crystalline or granular. Testaceous shells are not cast as crustaceous shells are, but are built up and enlarged at the rim.

Shells should be collected for the beauty of their colour or shape.

Simple scheme of classification.

(*a*) *Univalves.*—1, Twisted; 2, Trumpet-shaped; 3, Rock-shells; 4, Top-shaped; 5, China shells; 6, Cones.

(*b*) *Bivalves.*—1, Toothed edge; 2, Plain edge.

(*c*) *Multivalves.*

Step V. Application.—The result of these lessons should be seen in the way the children spend their holidays, not only gaining health and strength from the sea-breezes, but also improving mentally by cultivating their powers of observation and increasing their knowledge of the wonderful works of the Divine Creator. A further result should be a valuable addition to the school museum.

NOTES ON AN EXPERIMENTAL COURSE OF LESSONS ON AIR AND WATER.

BY EDWARD J. RUSSELL, D.SC. (LOND.),

Lecturer in Chemistry at the South-Eastern Agricultural College, Wye.

(*Continued from p.* 33.)

Cooking at High Altitudes.

IT has already been pointed out that as one ascends a mountain the pressure exerted by the atmosphere decreases; it follows from Experiments 88, 89, and 90, that the temperature at which water boils will also decrease with increasing altitude. At the top of a mountain boiling water is not as hot as at sea-level, and cannot be used for cooking. The teacher will remember that during the recent Thibet expedition our soldiers suffered considerably because their rice would not cook properly; this effect could easily have been predicted. It is illustrated very well by the following experiment:—

Experiment 91.—Obtain a round-bottomed flask with a neck sufficiently large to allow an egg to go inside, fit with a good rubber cork bored with one hole, connect with the air-pump through a condenser to prevent steam getting into the valves. It is just as well to attach by means of a T-piece a tube 32 inches high standing in mercury to record the pressure in the apparatus.

The simplest condenser is furnished by a flask standing in a mixture of ice and salt; it must be provided with two tubes joined respectively to the flask containing the egg and to the T-piece.

Having put the egg into the water, exhaust the apparatus and boil. Continue to work the pump and boil fast for four or five minutes, then remove the egg and break it open; it is found to be quite uncooked. The boiling water can be poured over the hand without fear of scalds, and it adds distinctly to the effect of the experiment to remove the egg in this way.

The flask and cork have usually to be ordered specially from the instrument-makers; the flasks cost 6d. each and the corks about 1s. 6d.

With a small class variations of the experiment are easy to carry out; thus the boiling water may be converted into tea or coffee, but owing to the ready solubility of the colouring matter there is not usually much difference in appearance from the same beverage made with ordinary boiling water. There is a considerable difference in taste, however.

Change of Vapour and Liquid.

Water vapour, or steam, is invisible, but on cooling it forms an immense number of tiny drops of liquid water which reflect and scatter light to such an extent that they appear white.

Experiment 92.—Fit a tin can containing water with a tube leading to an inverted flask, and boil vigorously. For a few moments the flask is filled with a white mist, but it soon becomes too hot to allow condensation to take place, and the transparency of the steam then becomes evident.

Cooling can be produced by altering the pressure of the air. It is a familiar fact that when air is compressed it becomes heated; an excellent illustration of this is obtained in pumping up a bicycle tyre—the pump is found to become quite hot. It has already been stated that natural processes are usually reversible, and we have here another example. When the compressed air is released it cools, and some of the moisture contained in it is deposited as mist.

Experiment 93.—Moisten the inside of a large flask, connect with a bicycle pump, and see that the cork and rubber tubes fit well. Pump air into the flask, then *suddenly* release the pressure. A thick mist is produced.

Experiment 94.— Using the same flask, reduce the pressure by quickly working the air-pump for a few moments. Again a mist is obtained.

Mist and Dew.

Whatever the cooling agent may be, the deposition of mist follows the same lines. Thus, when the cold evening air sinks from the tops of the hills into the valley and meets and chills the warmer air loaded with water vapour, the liquid is deposited as dew. Again, when the warm sea air blows to the shore at night, the colder land condenses the vapour, and a fog is produced. After a hot day, too, in the neighbourhood of a river, when evaporation has been vigorous, and there has been little wind to remove the water vapour as it has been produced, the lowering of temperature which follows after sunset causes the formation of a heavy mist. All these illustrations show further that water vapour is invisible, and only the minute drops of liquid first formed can be seen.

Fog.

A fog differs from a mist in its persistence, and in containing various impurities.

Experiment 95.—Repeat Experiment 94 and show the mist, then introduce a little of the fume from burning sulphur and again remove a little air. The fog produced is very dense, and remains in the flask for quite a long time.

One can readily show that sulphur compounds are present in fog, and the experiment is very suitable for an evening class, but cannot usually be performed in a day school.

Rain.

If cooling is rapid instead of being gradual, the particles of mist coalesce to form large drops, which then fall as rain.

Experiment 96.—Use the apparatus of Experiment 90, but cool a portion of the flask with wet blotting paper. Drops of liquid fall from the neck.

Freezing of Water.

When cooling proceeds still further, the liquid sets to beautiful crystals, forming snow, hoar frost, or ice.

Experiment 97.—Pour a mixture of ice and salt into a clean beaker—the moisture from the air condenses, forming hoar frost. The temperature of the mixture is so low that the frost persists for a long time, and the scholars can see its crystalline form under a lens.

Expansion produced on Freezing.

Experiment 98.—Fill an iron bottle with water, screw in the stopper and place in a mixture of ice and salt. Care must be taken that the bottle is absolutely full, and no air left, or the experiment may become dangerous. Cover with duster and put under a desk or in a cupboard. In a few moments a dull thud is heard and the bottle is found to have burst. Personally, I have never known the pieces to fly, but instances are on record where the bottle burst with considerable violence, and I accordingly always adopt the above precautions.

Iron bottles made for the purpose can be purchased very cheaply.

Experiment 99.—Hammer up the end of a 6-inch length of "compo" tubing, fill with water, and close up the other end. Put into a freezing mixture; if the closing has been properly done the tube bursts.

The scholars should draw the inference that water-pipes will burst during a frost, and the mischief will become evident when the thaw sets in. Those living near a chalk pit, or near to cliffs made of slate, shale, or other soft substance, will know that after a frost large pieces of the rock are reduced to small fragments through this cause.

Plant cells are normally filled with sap, which behaves on freezing in the same way.

Experiment 100.—Put a gooseberry, strawberry, or other watery fruit into ice and salt. The fruit splits.

After the cells have burst, bacteria and fungi have no difficulty in gaining access to the contents and setting up various chemical changes causing considerable deterioration. The poor taste of frozen meat is due to the splitting of the cells, and the loss, from mechanical and bacterial causes, of the juices.

Melting of Ice under Pressure.

Experiment 101.—Press pieces of ice together—the pressure causes some of the ice to melt, but on releasing it the liquid freezes again and the pieces are cemented together.

Experiment 102.—Support a block of ice at the two ends, round the middle pass a stout wire and attach a 56-lb. weight. The ice melts under the wire, and the water freezes above it where there is no pressure, the wire passes through but the block is left entire.

The lowering of the freezing point produced by pressure is not great; it amounts only to ·0075° C. for every atmosphere pressure, yet many phenomena are caused by this small change. Prof. Osborne Reynolds has shown that in skating the weight of the body causes the ice to melt, and the film of water produced acts as a lubricant. Friction is thus reduced to a minimum, and high speeds can be attained. The formation and use of a slide is no doubt explained in the same way; however rough the surface of the ice, the alternate melting and freezing resulting from continual passage over it reduce the surface to a dead level, the water film acts as a lubricant, and little friction is noticed. The movement of large masses of ice—*e.g.* glaciers—are also influenced by the same cause.

THE PHYSIOTYPE IN NATURE-STUDY.

A SIMPLE AND BEAUTIFUL METHOD OF OBTAINING NATURE-PRINTS DIRECT FROM BOTANICAL SPECIMENS.

THE prominence afforded to Nature-study at the present time lends, from a teacher's point of view, a special interest to a beautiful and highly ingenious method of obtaining facsimile "nature-prints" which has quite recently made its appearance. The process is appropriately named the "Physiotype," and

FIG. 1.—PHYSIOTYPE OF A LEAF.

it is hard to say whether it is more remarkable for the results yielded, or for the simplicity with which they are obtained. The system may be briefly defined as one whereby facsimile reproductions of objects are obtained by direct contact with them under pressure, followed by a simple powder-printing (*i.e.* developing) process, and a fixing process.

It is not too much to say that, by means of the Physiotype, the hedgerow may be made to afford, in an entirely novel way, a pleasurable and elevating recreation of such a kind as is sufficient to establish the value of the system as an auxiliary to the efforts of the teacher to bring home to his pupils the charm of Nature's productions, and the exquisite craftsmanship displayed in her workshops.

FIG. 2.—SPRAY OF FERN.

The accompanying illustrations are photographic reproductions of direct prints taken by the Physiotype.

The inventor and patentee of the process is Mr. Francis Sheridan, of Catford, London, S.E., a lithographic expert. That the system has attracted, in so short a time, so much attention in authoritative circles, is eloquent testimony to its value. In the autumn of last year, the inventor accepted an invitation to demonstrate the process at a meeting of the Royal Society. In January of this year the invention attracted marked attention at a four days' conversazione of the Birmingham and Midlands Institute. On February 3, the Physiotype was again demonstrated by Mr. Sheridan at the invitation of the Royal Institution. Numerous other demonstrations have also been given before representatives of various scientific and commercial interests. A few weeks ago

FIG. 3.—REPRODUCTION OF A PHYSIOTYPE.

FIG. 4.—A FLORIN.

the writer was invited to attend one of these meetings, the company including experts in printing, lithography, photography, and—criminology, the Criminal Investigation Department of New Scotland Yard being represented by two departmental chiefs.

By means of the Physiotype, representations may be readily obtained on paper, glass, enamel, metal, wood,

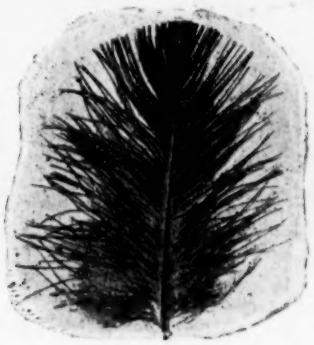


FIG. 5.—FEATHER.

silk, etc., of the surface appearance of any natural object or artificial article possessing a flat or approximately flat surface—such as leaves, flowers, ferns, grasses, fruit-skins, sections of wood, bulbs, vegetables, etc.; lace, embroidery, feathers, coins, medals, finger-prints, and so on.

Observe, for example, the Physiotypes photographically reproduced in Figs. 1, 2, and 3. At the time when it was submitted to the process, each subject was a living botanical specimen, gathered for the express purpose of obtaining a *self-picture*. Fig. 4, a florin, shows the treatment of coins and medals. Figs. 5 and 6 are feathers.

FIG. 6.—FEATHER.

The apparatus is both simple and inexpensive, consisting of developing powder, clearing composition, fixing composition, prepared paper, printing paper, and a copying-press or roller squeegee—a few shillings sufficing to obtain the complete outfit.

The *modus operandi* is as follows: The object of which it is desired to obtain a "self-picture" is placed between sheets of Physiotype prepared paper, and is

subjected for a few moments to a firm and even pressure, by means of a copying-press, india-rubber roller squeegee, or even a flat-iron or a paper-knife. Having been sufficiently prepared, the specimen is placed upon a sheet of Physiotype printing paper, and inserted between a few sheets of blotting-paper, when it is again submitted to pressure for about a minute. The specimen is lightly tossed from the paper, and the design is ready for developing. Two impressions can be obtained simultaneously, one of the upper, and the other of the under surface, by using two sheets of printing paper, one being placed above and the other beneath the specimen. Having ready to hand a small heap of developing powder, the sheet bearing the impression is taken up by opposite corners, and a small quantity of developing powder is spread along one edge, by inserting it into the powder. Tilting the paper very gradually, the powder rolls slowly forward, passing over the invisible impression of the specimen. By tilting the paper in the reverse direction, the powder once again passes across the impression, and so back to the heap from which it was taken.

As though by magic, there instantly appears, in absolute facsimile, a representation of the subject, perfect to the most minute detail, strongly resembling a

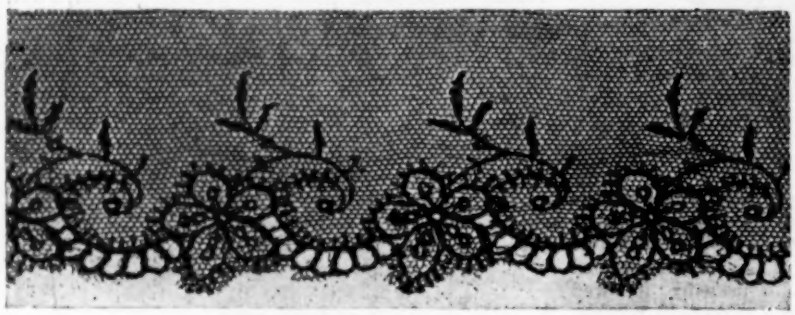


FIG. 7.—LACE FABRIC.

photograph by the platinotype or bromide processes—only better.

Still holding the sheet by opposite corners, a sharp snap, or fillip, removes from it any surplus powder.

At this stage, however, the paper presents a slightly soiled appearance. To remove this, it merely remains to pass over the sheet a small quantity of clearing-powder, in precisely the same manner as that employed in developing the impression. So far, the whole process can be accomplished in two or three minutes. Up to this point, however, the print is not permanent, but is liable to become smudged. It now requires "fixing." In a large shallow dish, or other suitable receptacle, is placed an adequate quantity of fixing-solution. Holding the unfixed print by opposite corners, and with the design uppermost, the corners are brought together by a simple looping movement, so that the paper assumes a U-shaped form. The bottom of the loop, or U, is allowed lightly to touch the fixing-solution. The sheet being released, lies flat on the surface of the liquid, floating face upward. The requisite chemical action takes place from the back of the sheet, about two minutes sufficing to fix the print with absolute indelibility. It remains only to dry the print between sheets of blotting-paper, or by suspension in the air by any convenient means. The process is now completed, and the Physiotype is exhibited in its final and finished state. And a beautiful thing it is, so delicate, indeed, than in some cases no hand, however skilled, could copy it. By maintaining certain proportions between the amount of developing-powder and clearing-powder employed,

FIG. 8.—FINGER-PRINTS.

and modifying the method in which they are used, prints in various monochrome tints can be obtained. Moreover, by mixing certain colouring matter with the developing-powder, various colours and gradations of colours can be obtained, such as sepia, indigo, yellow, brown, blue, green, and red. And this is not all. In dexterous hands, the process can be so manipulated that any, or all, of these colours may be combined, one portion of the print partaking of one colour, and another portion of another.

The most expeditious and satisfactory means of securing an even and efficient pressure, is, of course, obtained by the employment of a small copying-press. But, as has been said, excellent results accrue from the use of a roller squeegee, or even from the judicious application of the homely flat-iron.

The most cleanly and economical method of developing the print is by the use of a developing-box, into which the paper is dropped when the invisible impression has been secured. By this means the powder is distributed evenly over the paper, and none is spilled about the room. Characteristically enough, the inventor rarely uses a developing-box. In his private experiments this adjunct is superfluous, conducted as they are in a studio long since given over to powders

FIG. 9.—FINGER-PRINTS.

of all hues, papers bearing mysterious impregnations, bottles of chemicals, developing-dishes, and miscellaneous paraphernalia. Whilst in public, though confessing to a fondness for the "heigh, presto!" part of the process, he rightly prefers to exclude any element remotely suggestive of Messrs. Maskelyne and Cook.

For an outlay of a few shillings sufficient material

can be obtained to produce hundreds of prints, for the printing and developing powders can be used over and over again.

There is no "faking" or "touching-up" about the Physiotype process. Moreover, its operation can, with a little practice, be carried out as successfully by a child as by an adult. Another consideration, and a very important one, is that the chemicals employed are of an absolutely harmless nature.

The production of a pictorial replica of a living botanical specimen can hardly fail to act as a powerful incentive to a child to collect material for the purpose. In certain cases, better results are, of course, obtained from specimens that have been dried and pressed. The method of flowering, the form and structure of different portions of plants, together with the exquisite minutiæ by which many of them are characterised, should yield an added teaching-power of undeniable importance.

The employment of the Physiotype to this particular end, whilst great in itself, is, however, only one of the many uses to which the system is adapted. For instance, botanical lantern-slides can be made in a few *minutes*, and at a cost which is practically a "negligible quantity."

It is not the present purpose to enlarge upon the obvious commercial value of the invention. Its scope in this direction is sufficiently indicated by drawing attention to its application to lithography, designing, and printing on glass, metal, enamel, china, pottery, etc. Nor is it necessary to dwell at any length upon the wide field it opens up as applied to designs for embroidery on silk, or as the base of designs for painting upon china, door-panels, etc.

The beautiful and ever-original patterns taken straight from Nature render one independent of artificial designs.

The lace manufacturer will doubtless soon find the value of the process for sending out a replica of his goods. A Physiotype of lace fabric is depicted in Fig. 7.

Again, the application of the system to the detection of crime, by means of finger-prints (see Figs. 8 and 9), and its utility as a preventive against forgery and fraud, in the hands of the detective, the banker, and in the insurance world, is one of serious importance.

Turning aside, however, from these wide fields of usefulness, what will appeal most strongly to the teacher is the fact that Nature-study and Nature-printing may henceforth go hand in hand. For with confidence the assertion may be made that the teacher who tries the process for himself will quickly discover that there has been vouchsafed to him a revelation in the graphic arts.

ON BEGINNING A LESSON.

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ONE frequently hears the remark that "a good beginning is half the battle"; and the saying is certainly as true of teaching as of any of the other bellicose arts that would seem to be implied. The highest praise that can be given to a teacher, judged from the standpoint of method, is to say that he has the power of making the subject-matter of his teaching appear real and vital to the pupil; and this power depends to a large extent upon the manner in which, at the beginning of each lesson, the subject-matter is connected with the pupil's past experience. A thing is real or unreal to a person just in so far as it fits in or does not fit in with his past experience. A man who, walking along a deserted road by moonlight, sees before him what appears to be a ghostly form with arms ominously outstretched, rejects as unreal this interpretation of the object, simply because it is not in accordance with his past experience: what he really sees before him, he concludes, must be the trunk of a tree with its outstretched branches; he interprets the present in the light of his past experience, and thus perceives the reality that is inherent in it. So it is with the child in school: any subject-matter that he is not made to see as harmonising with his past experience will be to him but a shadowy form, as unreal in its essence as the seeming ghost to the man walking along the road. Hence the first task of a teacher, in every lesson that he gives, must be to connect the subject-matter with the pupil's past experience, and thus invest it with the air of reality.

One obvious means of doing this is, where possible, to associate the material of the lesson with places or objects or circumstances with which the pupil is familiar in his every-day life. This plan is especially useful in the case of lessons given to young children, whose range of knowledge is limited. The things that seem to a child to be most real are the things that he sees around him, and, as being most real, they also possess most interest for him. In a town where the custom of ringing the "curfew-bell" at eight o'clock is still observed, a young teacher effectively began a lesson on the reign of William I. by referring to the ringing of the bell heard each evening by the children. This led to a discussion of William's motives in instituting the practice, and to a general description of the conditions of the country during his reign. Thus the distant and dim past became, as it were, illumined for the pupils in the light of the present—of that present and actual which is always most vivid and real to children.

A second means of linking present with past experience, and so of creating interest in a lesson, is to indicate, where possible, how the knowledge to be acquired may be applied practically, may be of some actual use in every-day life. In arithmetic lessons and in object-lessons, especially, this is an obvious means of "Preparation."

From the nature of the case, however, it will be easily understood that these two devices cannot always be employed in beginning a lesson. The subject-matter under treatment cannot always be brought into obvious relation with the every-day life of the pupil. Most of the lessons taught in school form a continuation of lessons on the same subject given on previous days; the class resumes the study of some subject-matter that has been already partially set forth by the teacher or in a text-book. Hence, in class-work generally, the teacher will begin a lesson by referring to the matter of the previous day's lesson, or of previous days' lessons, on the same subject. The past experience to which the new subject-matter is linked will generally be some part of the knowledge that has been previously acquired

at school. Thus, revision often constitutes an effective "Preparation-Step."

It should be carefully noted, however, that this revision must not be a mere mechanical revision: from the previously given lessons only those facts should be selected that are essentially connected with the subject of the lesson to be given. Even experienced teachers, it may be feared, often fail in this respect, through carelessness: the habit is easily acquired of simply revising as a matter of course, at the beginning of each lesson, the immediately preceding lesson on the same subject, irrespective of any selection of material. Young teachers, again, seem to find great difficulty in choosing out from the pupils' past knowledge just those points that are directly relevant to the subject-matter in issue. Experience goes to show that the defective selection of preliminary matter for revision is the most frequently occurring fault at the beginning of lessons.

In the following paragraphs a brief description is given of the introductory sections of several lessons that illustrate this defect. They form a few out of many instances that have come under the writer's personal observation.

(1) A GRAMMAR LESSON: On the meaning of Gender and the names of the different Genders. The "Preparation-Step" consisted in a revision of previous lessons on the plural-endings of Nouns. No essential connection was established between the subject-matter of the lesson and that of the "Preparation-Step." The preliminary matter here indicated would have formed a suitable introduction only if the lesson had been one on the inflexions or endings for Gender. In such a lesson the previously learnt inflexions for Number would be given by the children; it would then be remarked that just as there are various inflexions for Number so there are different inflexions for Gender, and a comparison between the two classes of endings would be made in the course of the lesson. For the lesson that we are here discussing, in which the teacher's object was to explain the meaning of the term "Gender," and to give examples of the four Genders in English, a suitable "preparation" would be as follows: The pupils would be asked to give the names of things known to them—pencil, book, horse, man, woman, girl, etc. These would be written by the teacher on the blackboard, and classified by the children as being the names of "things without life" and "things with life." It would then be pointed out that, just as in the real world there are different kinds of things, just as there are living things and lifeless things, so in grammar there are different kinds (Genders) of names to correspond. The names of things without life are said to be of the neuter kind or Gender, the names of things with life are said to be of the masculine or the feminine or the common kind or Gender.

(2) A HISTORY LESSON: On the arms and armour and methods of warfare used by the Normans in England during the reign of Stephen. The "Preparation" consisted in a revision of the chief events that happened in the reigns of the four Norman kings. The mistake here made was that the method of "wholesale revision" (as it may be called) was adopted; there was no intelligent selection of facts known to the pupil. The teacher should have recalled only such events as the battles and sieges of the period—this class of facts being intimately related to the subject of the lesson. Reference might have been made to the weapons and methods of fighting adopted at the present day, and more particularly to the war between Japan and Russia. The military equipment of the Normans would then have been contrasted with that of our own times.

(3) A GEOGRAPHY LESSON: On the Minerals of Asia. Lessons had been given previously on the Vegetation and Animals of Asia, and the "Preparation-Step" consisted in a revisal of these lessons. The only point of connection established between the previous lessons and that about to be given lay in the circumstance that the subject of both was connected with Asia. Apart from this, however, it may be remarked that, for obvious reasons, a lesson on the Minerals of a country should precede, and not follow, lessons on the Vegetation and Animals; and therefore the latter should not be used as a preparation for the former. In giving the lesson in question, the teacher would introduce the subject by some preliminary talk about Minerals generally. The pupils all know what Minerals are, and how their presence in a country adds to its wealth and prosperity. In the pupils' own country, and in the district where they themselves live, various Minerals are found. What are the names of some Minerals known to them? A selection of the names given is written in a column on the blackboard (this column forming the starting-point of the blackboard summary), and the children are told that they are going to learn something of these Minerals as they are found in different parts of Asia.

(4) AN ARITHMETIC LESSON: On Compound Addition of Money. The "preparation" consisted in a series of easy oral sums involving the four simple rules. Questioned as to his reason for selecting this as the introductory matter, the teacher replied that the four rules had formed the subject of the immediately preceding lessons. Here again there was no intelligent selection of material: omitting the examples in subtraction, multiplication, and division, the teacher should have started with some easy sums in addition only—this being the previously learnt rule standing in closest connection with the lesson in issue. After beginning in this way, the teacher might have shown the analogy that exists between the method of Compound Addition and that of Simple Addition.

In the course of the preceding remarks it has been indicated that there are three devices that may be employed at the beginning of a lesson to excite interest. In the first place, the material of the lesson may be associated with places or objects which the pupil sees around him in his daily life. Secondly, the practical utility of the subject-matter may be shown. Thirdly, reference may be made to previously given lessons on related subjects. With a view to showing how these three devices may be used together in a new lesson, the following "Preparation-Step" of a First Lesson in Latin is described. This theme is selected because it introduces to the pupil an entirely new subject of study. In such a case all the resources available for exciting interest in the subject may be employed by the teacher. His aim in this First Lesson is to interest the pupils in the idea of learning Latin, and to introduce a few nouns of the First Declension.

The pupils are told that they are about to begin the study of Latin, the language spoken by the old Romans, the people of Rome, long ago. The children say where the city is situated, and point out the place on the map of Europe—their previous knowledge of Geography is used. At the present time Rome is a

great city—the capital of Italy; but long ago, nineteen hundred years ago, it was quite the most important city in the world, the wealthiest and the most powerful. The pupils have read about the Romans in the New Testament, in the Gospels, and in the Acts of the Apostles; and from their reading they know that the Romans in those times were the ruling people in Palestine, in Greece, and in Asia Minor. They were indeed the ruling people throughout the world: being a great nation of soldiers, a fighting and conquering race, they had gradually made themselves masters of almost the whole known world. From Rome they extended their power first over all Italy; then they conquered Spain and France; and from France they came across the Channel to our own country, to Britain. The pupils have all heard of Julius Cæsar and of the Roman occupation, and are eager to answer a few questions on those subjects: their previously acquired knowledge of history is used as a means of exciting interest. It is the language that was spoken by Cæsar and his men that they are about to learn. The Romans lived in Britain for nearly four hundred years: they made roads in the country, built walls, and in many places, as was the custom of this military people, they formed camps (*castra*). Some remains of these roads and walls and camps are still to be seen in certain parts of our country. Where these exist in the neighbourhood of the school, the teacher may mention the circumstance: an appeal is made to the local interests of the pupils. The likeness between the Latin word for "camp" and the name "Chester" is pointed out, and the children are asked for the names of other towns ending in -chester, -caster, or -cester. From the examples given it is inferred that the names of some of our towns are derived from the Latin word *castra*. Other names of English towns are derived from other Latin words. And not only are the names of some of our towns so derived, but a very large number of other English words—many of those that we use in general conversation—are derived from Latin, having been introduced into our language at various times. Take, for instance, the word "isle"; its Latin equivalent is *insula*, from which the English word comes (*cp.* also "peninsula"). Other similar instances may be given. A knowledge of Latin, then, will help us to know our own language better: the practical utility of the subject is shown, as being likely to add to the interest of the study. Some nouns of the First Declension may then be introduced and written on the blackboard, and the way has been paved for a more formal treatment of the subject.

In a lesson such as this, the first lesson in a wide and varied field of study, the greater part of the matter taken will be of the nature of introductory matter; and the devices used will be chiefly those appropriate to a "Preparation-Step." Thus, reference is made to objects or circumstances with which the pupil is familiar in his every-day life; or the practical bearing and utility of the subject is indicated; or previous lessons on points essentially connected with the subject are used. And the principle underlying all these devices is one and the same, the teacher's first object being to link the subject-matter of his lesson with the past experience of the pupil, thus investing it with the air of reality.

HOW I TEACH NATURE STUDY IN LONDON.

(Being a Synopsis of a Paper read by W. Cross, Esq., at a Meeting of the Nature Study Union at the College of Preceptors.)

THE introduction of this fascinating study into a school is a very simple matter, and does not by any means require that the teacher should be an expert in any of the ologies. Nothing more elaborate is necessary than a systematic attempt to utilise and deepen the children's interest in the animal and plant life of their immediate surroundings.

I commenced a course of Nature Study for the benefit of some seventy boys in one of the crowded districts of London by begging from a periwinkle vendor all the shells in which hermit crabs had found a home. The examination of these interesting creatures opened up a way to a simple discussion on the meaning of the crab's various appendages, its enforced selection of an empty shell for the softer half of its body, and its cleverness in selecting a home to fit properly.

In the succeeding lesson the periwinkle itself was the object of study—the spiral growth of its shell, the easily distinguished parts of its body, and the lid attached in such a way that it always came last when the animal retreated to its dwelling-place.

A suggestion that whelks might be worth our notice, resulted in the boys bringing in not only a large selection, but also a fine assortment of hermit crabs in whelk shells; these facts and specimens were afterwards taken as subjects for composition and drawing exercises, with gratifying results.

At the time of this simple beginning—March—Narcissi were to be seen on sale everywhere, and the opportunity was taken of arousing an interest in the plant world by the telling of the old, old story of Narcissus and Echo. The legend of Hyacinthus followed, and the way was then open for the examination of the flowers as to structure; a simple beginning that in a few weeks led to much intimacy with many secrets of plant life. The usual drawing and composition exercises followed.

The next step was to introduce some toad spawn into a simple jar of water equipped with common aquatic plants. The development of frogs, toads, and newts were watched, and in the course of time the perfected creatures were taken away from the schoolroom and liberated in an adjoining public park. As the weeks went by, extra jars were introduced for the reception of fresh-water relations of the periwinkle and whelk, whilst Saturday morning excursions to neighbouring commons rewarded us with the larvæ of dragon flies and other denizens of pond life; successful attempts were made to keep these in healthy confinement, by copying as closely as possible the conditions in which they were first found.

The buttercup, the daisy, and the dandelion and a few other common wayside flowers were studied, and ere autumn came, the children had, as a matter of assimilated knowledge, a considerable array of scientific facts—unburdened by even a shadow of technicality—upon which they could converse and write intelligently.

The Practical
Infant-School Teacher.

SCHOOL GARDENING FOR LITTLE CHILDREN.

BY LUCY R. LATTER.

PART VIII.—(*Continued*).

The Chrysalides show signs of waking up.

"Say not Good-Night—but in some brighter clime
Bid me Good Morning."

As the bright days of Spring approach some of the chrysalides look as if they would soon wake up. They are a little restless; then they seem to get quieter and become a little different in colour. The little creatures within the "horny" cases are now visible.

The children watch the school chrysalides very closely now. They observe them making curious jerky movements from time to time with what seems to be the tail end of their body. Later these movements seem to cease, and the chrysalides get somewhat different in colour.

Keener interest than ever is aroused in the children.

The Awakening.

At last a wonderful thing happens. The sleepy little creatures wake up and are now quite different. They are now lovely butterflies. Note their delicate form and graceful movements, their appearance when they emerge from the chrysalis case.

May 1st.—In one of the glass jars in the babies' room a butterfly found to have emerged from its chrysalis case. A prettier and more comfortable home is given to it. The little creature is carefully transferred on a twig to the larva house in the hall, where it finds a friend—another butterfly, which emerged from its chrysalis case a few days earlier.

Feeding of the little creatures. Fresh flowers and moistened sugar put for them in the larva house each morning. The older children record the date of the awakening of each butterfly in school. They watch in the garden for the appearance of any butterflies there and record the date of the same.

Note.—As the weather becomes warmer other butterflies emerge from their chrysalis case, and are similarly cared for.

The Empty Chrysalis Case.

It is no longer as beautiful as when tenanted. Its horny character. The way in which it split to let the butterfly out.

The children collect the empty cases from the jars and examine them.

The Butterfly, what it does. What it feeds on. How it feeds. Its wonderful tongue.

The cabbage butterfly feeds solely on substances of a liquid nature which it sucks up through its wonderful tongue—a long and slender tube, which is coiled like the springs of a watch to protect it from injury when not in use.

(On this occasion the school butterflies are fed during the lesson, in order that the children may have the special opportunity of seeing the tongue in use.)

Individual children put a lump of moistened sugar or a little honey diluted with water on a flower near a butterfly in the larva house, and then watch what happens. They see how the butterfly uncoils its tongue, and inserts the end in the wet sugar, or in the honey. They also see how it coils its tongue up again when it has had enough food. The children recall the pretty red and black butterfly they saw sipping nectar from a flower in the garden the previous autumn. They watch other butterfly visitors now, and note what flowers they seem to frequent in the garden.

The Form, Covering, and Colour of the Large White Cabbage Butterfly.

The ringed body, somewhat cylindrical in form and tapering a little towards the end. Length about three-quarters of an inch, and not extending beyond the extreme margin of the hind wings. The downy covering. Its colour.

The chief parts of the body. (A good drawing useful here).

The children examine the butterflies in the larva house.

The Butterfly's Head.

Its shape and (relative) size. The feelers, their use to the butterfly. Its wonderful eyes; they never move and yet the butterfly is able to see very well.

The mouth, the tongue or sucking tube.

The children examine the butterflies in the larva house as before.

Organs of Locomotion. The Wings of the Large White Cabbage Butterfly.

Their number and shape. The part of the body to which they are attached. Their covering. Their powdered appearance.

Examination of the butterflies in the larva house. A magnifying glass may be used here with advantage.

The Colour of the Wings and the Beautiful Markings on them.

The markings help us to know the mother butterfly from the father butterfly. The wings depend upon their "powdery" covering (the scales) for their lovely colour.

* How the colouring of the butterfly affects the daily life and welfare of the creature.

The children examine the butterflies in the larva house, and distinguish the mother butterfly from the father butterfly.

They watch the butterflies in the garden, and find it sometimes difficult to tell a butterfly from the flower on which it is resting, because of the similarity of colour between the under part of the butterfly's body and wings and that of the flower.

The Legs of the Butterfly.

The part of the body to which they are attached. Their number. Downy near the body. Very weak and only used when resting or eating.

The children watch the school butterflies. * *They notice how the little creatures place their legs when standing—when flying.*

The Habits of the Butterfly.

The butterfly loves the sunshine, and on warm bright days flits about among the flowers "like a free and happy spirit," adding to the beauty of the world. It generally goes to rest at or before sunset. In dull and rainy weather it flies but little, hiding itself in sheltered places. * The character of its flight. The position of the wings in flight and at rest. The special name of the butterflies the children have been keeping in school.

The butterflies developed in school are set free in the garden, and watched on the flowers in the sunshine. Any eggs left in their old temporary homes are carefully preserved and watched.

Work in the Garden.

September and October.

Cabbage and other beds cleared of caterpillars.

Caterpillars taken into school to be taken care of, and watched there during the ensuing months.

Gathering in of ripened seeds.

Taking up of spent plants.

Collecting of dead leaves for leaf mould.

Preparing of beds for the setting of bulbs later on.

Putting of artificial manure on the beds, and adding a little fresh earth.

May.

Tying up the straggling foliage of bulbous plants.

Plaiting the leaves of spent crocuses and turning their ends into the soil.

Watering of plants.

Weeding of beds.

Nailing up strings on the fence for the runner beans.

Cleansing of the ivy on the fence.

Plants and beds watched and protected from troublesome animal visitors, such as sparrows, aphis, ants, slugs, and caterpillars.

Fresh gravel laid on the paths.

* Points with an asterisk against them are only for the upper part of the school.

(List of Reference Books will be given next month.)

IV. The Gifts, Occupations, Games, Stories, Pictures, Recitations, and Hymns used in Connection.

	Class I.	Class II.	Class III.	Class IV.	Class V.	Class VI.
Drawing (Free and other).	Cabbage leaf with cluster of cabbage butterfly eggs upon it. Caterpillar upon a cabbage leaf. Riddled cabbage leaves. Plan of vegetable garden (position of cabbage beds indicated thereon). Glass jar. Front of larva house. Chrysalis on a twig. Butterfly in flight; at rest on a cabbage flower. Other flowers visited by the cabbage butterfly. Plan of the flower-garden. Honey-pot, sugar-bowl.	Cabbage leaf with cluster of cabbage butterfly eggs upon it. Caterpillar upon a cabbage leaf. Riddled cabbage leaves. Plan of the cabbage beds. Glass jar. Front of larva house. Chrysalis on a twig. Butterfly in flight. Butterfly at rest on a cabbage flower. Other flowers visited by the cabbage butterfly. Plan of the flower beds held by the class. Honey-pot, sugar-bowl.	Cabbage leaf with cluster of cabbage butterfly eggs upon it. Caterpillar upon a cabbage leaf. Riddled cabbage leaves. Glass jar. Front of larva house. A twig. Butterfly in flight. Butterfly at rest on a cabbage flower. Other flowers visited by the cabbage butterfly. Honey-pot, sugar-bowl.	Cabbage leaf with cluster of cabbage butterfly eggs upon it. Caterpillar upon a cabbage leaf. Riddled cabbage leaves. Glass jar. Front of larva house. Twig. Butterfly in flight. Butterfly at rest on a cabbage flower. Honey-pot, sugar-bowl.	Caterpillar. Caterpillar on a cabbage leaf. Riddled cabbage leaves. Glass jar. Twig. Butterfly in flight. Butterfly at rest on a cabbage flower. Honey-pot, sugar-jar.	Caterpillar. Caterpillar on a cabbage leaf. Riddled cabbage leaves. Twig. Butterfly in flight. Honey-pot. Sugar jar.
Brushwork and Colouring.	Eggs on a cabbage leaf. Caterpillar on a cabbage leaf. Riddled cabbage leaf. Chrysalis on a twig. Butterfly in flight. The cabbage flower. Other flowers visited by the cabbage butterfly. Butterfly at rest on a cabbage flower.	Eggs on a cabbage leaf. Caterpillar on a cabbage leaf. Riddled cabbage leaf. Chrysalis on a twig. Butterfly in flight. The cabbage flower. Other flowers visited by the cabbage butterfly. Butterfly at rest on a cabbage flower.	Eggs on a cabbage leaf. Caterpillar on a cabbage leaf. Riddled cabbage leaf. Chrysalis on a twig. Butterfly in flight. Cabbage flower.	Caterpillar. Riddled cabbage leaf. Twig. Butterfly in flight. Cabbage flower.		
Modelling.	Cabbage leaf with eggs upon it. Caterpillar upon a cabbage leaf. Riddled cabbage leaf. Butterfly in flight. Butterfly at rest on a cabbage flower. Honey-pot, sugar-bowl.	Caterpillar upon a cabbage leaf. Riddled cabbage leaf. Butterfly in flight. Butterfly at rest on a twig. Honey-pot, sugar-bowl.				

IV. The Gifts, Occupations, Games, Stories, Pictures, Recitations, and Hymns used—(*Continued.*)

	Class I.	Class II.	Class III.	Class IV.	Class V.	Class VI.
Paper Folding.	Box, double vase, flower, butterfly, honey-pot, sugar-bowl (square and oblong-shaped papers).	Box, vase, flower, butterfly, sugar-bowl, sugar-tongs, (square-shaped paper).	Window, box, duster, flower-vase, sugar-bowl, sugar-tongs (square-shaped paper).			
Gift IV. (Classes II. and III.) Gift III. (Classes IV. and V.) Tablets † (Squares).		Plan of the school-garden (collective work). Garden fence, gateway, garden, box, window, honey-pot, sugar-bowl.	Garden fence, garden, box, window, honey-pot, sugar-bowl.	Garden walls, garden, gateway, box, window, sugar-bowl. † Objects made with Gift III. reproduced on the flat.	Garden walls, garden, gateway, box, window, sugar-bowl.	
Rings and Sticks (Class III.) Sticks or Laths Classes IV., V., VI.)			Glass jar, front of larva house, twig, flower, butterfly, honey-pot, spoon, sugar-bowl, sugar-tongs, window.	Glass jar, front of larva house, twig, butterfly, honey-pot, window.	Twig, butterfly, front of larva house, window, garden fence.	Twig, butterfly, front of larva house, window, garden fence.
Jointed Lath (Class V.) Fraying (Class VI.)					Window, front of box, twig, butterfly, honey-pot, garden fence.	Covers for glass jars and larva house, mats to go under the glass jars, little brooms to sweep out the boxes in which various kinds of caterpillars are kept
Gift II.					Exercises with the cylinder (roller for the sand gardens and parks). Exercises with the cube (watering-can, &c., for the sand gardens and parks).	Exercises with the cylinder (roller for the sand gardens and parks). Exercises with the cube (watering-can, &c., for the sand gardens and parks).
Sandwork.					Garden and park in autumn (bead caterpillars added). Garden and park in spring (little paper butterflies added).	Garden and park in autumn (bead caterpillars added). Garden and park in spring (little paper butterflies added).
Thread Laying.					Leaf, caterpillar, jar, chrysalis, twig, butterfly, flower, sugar-bowl, honey-pot, spoon.	Leaf, caterpillar, jar, twig, butterfly, flower, sugar-bowl, honey-pot, spoon, sugar-tongs.
Bead Threading.						Little caterpillars, butterflies, flowers, &c. (small beads threaded on fine wire and then twisted into the required shapes), for the sand gardens and parks.
Games.	The Butterflies. Nature's Easter Story.	The Butterfly's Lady-Love ("The Wild Bee's Lady-Love" adapted).	Spring Time Joy.	Awake! Awake!	The Caterpillar ("a creeping thing upon the ground"). Butterflies.	The Caterpillar. Butterflies.
Stories.	A Lesson of Faith.	The Green Caterpillar.	Such a Beauty!	The Spring Butterfly.	The Caterpillar that went to Sleep. The Butterfly Baby.	The Cocoon. An Early Butterfly.
Pictures.	Summer (F. Hines). Spring (F. Hines).	Summer (Seasons: Fitzroy). Spring (Seasons: Fitzroy).	Pictures of the Months (Fitzroy).	Happy Days (Fred Morgan). A Day in the Country (W. & A. K. Johnston).	The Garden Gate (Froebel). Happy Days of Spring (Forman).	The Little Gardener (Froebel). Happy Days of Spring (Forman).
Recitations.	The Caterpillar's Wings.	The Caterpillar's Dream.	"Butterflies."	"Butterflies are Pretty Things."		
Hymns.	Summer suns are glowing. When the earth wakes up in gladness.	As in I.	As in I.	As in I.	As in I.	As in I.

FRENCH PRIZE COMPETITION.

RULES.

1. All translations should be **posted not later than September 8, 1905,** and addressed:—PRIZE EDITOR, Office of the *Practical Teacher*, 35 and 36 Paternoster Row, London, E.C.
2. Competitors should cut out and send the Coupon which appears on the Back Wrapper page of the current number.
3. Competitors should write pseudonym only on MS. Prize-winner will be asked to send name and address for publication.
4. No competitor may take the prize offered more than once in three months.

A Prize of Half a Guinea is offered for the best rendering into English of the following extract:—

Les héros de ce théâtre nouveau ce seront ceux que nous cotoyons tous les jours dans la rue et sur la place publique, dans les salons et dans les théâtres, dans les cafés et dans les magasins, en voyage et dans nos pénates, à la ville et à la campagne. Voici le parvenu égoïste et brutal, l'artiste dévoyé ou incompris, le financier sans scrupules, l'industriel intéressé, les tisserands acculés à la misère la plus noire, les grévistes que la faim oblige d'accepter les conditions de leur patron. Voici le policier tracassier, le pasteur aux principes rigides mais bon vivant dans la pratique, le politicien mettant tout en œuvre pour se faire élire, le gentilhomme attaché aux préjugés de sa caste et le paysan rivé à la glèbe. Voici encore le voyageur devenu étranger à sa famille et se sentant dépaysé dans le milieu qui l'a vu naître, l'officier autoritaire et tyrannique, la mère de famille insignifiante et esclave de son mari. Voici enfin la jeune fille aigrie qui s'émancipe parce qu'elle est réduite à l'esclavage au sein de sa famille, la femme libre de toute entrave qui méprise les conventions dont elle s'est dégagée et les préjugés auxquels elle a renoncé. Tels sont les personnages qui s'agitent dans les drames de l'école réaliste; leurs sentiments vont être analysés dans leurs moindres détails, leur caractère sera fouillé avec un soin presque trop minutieux, leurs aspirations seront décrites avec une conscience que rien ne lasse, leurs amertumes et leurs dégoûts seront représentés sans ménagements, leurs hésitations, leurs remords, leurs rêves eux-mêmes vont prendre une forme vivante et concrète, et le poète saura comprendre leurs désillusions inavouées et leurs souffrances les plus habilement dissimulées, leurs aspirations vers un idéal meilleur et leur désespérance profonde en face de la réalité présente. HENRI SCHOEN.

RESULT OF THE JULY COMPETITION.

The prize is awarded to "Mair." (Will "Mair" kindly forward name and address for publication?)

First Class.—Lemuel Gulliver, Eicarg, St. Regulus, E.S.L.A., Agaznog, Jabberwock, Notts, Len, Radiobe, Carola, Kirsteen, Carpe diem, Vivette, Shakspere, First time, D.S.G., Ernestine, Hiawatha, Chaos, Bracebridge, Nil desperandum, Merle, P.H., Oliver Twist, Rienzi, Iphigénie, Le Bourgeois gentilhomme, L'avare, Caudebec, Rien, Gobaith, Lucretius, Osborne, Gabrielle, La débutante, Ross, Fido, Français, Fertilis, E.M.B., Joli-cœur, Maxwell, Baldur, Tyro, Zodiac.

Second Class.—Leo, Englander, Portia, Yllop, V.W.X., Tatcho, Nylmat, Hope, Odd no., Bâtonallié, Mr. Micawber, Excelsior, Try again, Cæsar, Clio, Dot, Meg, Jo, Marmion, Eachin, P.T., Siskin, Rubens, Hazlewood, Middle Hill, Marlow.

The name and address of "Agaznog," the successful competitor in June, are:—Miss Annie Keating, St. John's Priory, Banbury, Oxon.

Report.

There are not many compositions of striking merit this month. Many translations, otherwise good, are spoiled by some error of a rather grave nature. Some translations are exceedingly far-fetched. *Une vraie montagne* becomes "the arrant Convention party"; *ces pointes blessantes*, "these blessed points;" *les mœurs si paisibles*, "death so tranquil"; *une femme est nue*, "a woman was clouded"; *de sorte qu'il y a cinquante beautés*, "then there is a conquering beauty"; *nous délasse de nos trottoirs, de nos bureaux et de nos boutiques*, "we retreat from the footway with our board and implements."

Prize Translation.

You should know that our modern taste will be as transient as that of bygone days; which amounts to saying that it is equally reasonable and equally foolish. We have the right of admiring wild scenery just as much as our ancestors had the right of thinking such scenery uninteresting. Nothing was considered uglier in the seventeenth century than a real mountain. It brought to one's mind a thousand dismal ideas. The people who were just emerging from civil wars and from semi-barbarism thought of famines, of long journeys on horseback through the rain and the snow, of the bad rye-bread mixed with straw, of the dirty inns infested with vermin. They were tired of barbarism, just as we are tired of civilisation. To-day the streets are so clean, the constables so numerous, the houses in such straight rows, habits so peaceable, events so trifling and so well foreseen, that we like the great and the unexpected. Landscape changes like literature; formerly the latter supplied long sentimental novels and gallant dissertations, to-day it supplies violent poetry and physiological dramas.

Scenery is an unwritten literature; like the latter it is a sort of flattery addressed to our passions, or food offered for our needs. Those old devastated mountains, those rough points bristling by myriads, those formidable fissures whose perpendicular wall plunges with a bound into invisible depths; that chaos of monstrous ridges which are piled up on each other and crush each other like a frightened troop of leviathans; that universal and implacable domination of the bare rock, the enemy of life, refreshes us after our pavements, our offices, and our shops. You like it only for this reason, and if this reason were taken away, it would be as distasteful to you as to Mme. de Maintenon. So that there are fifty forms of beauty—one for each century. Certainly. Then there are none at all. It is as if you said that a woman is unclothed because she has fifty dresses.

MAIR.

OUR TUTORIAL SECTION

OUR PUPIL TEACHERS' AND SCHOLARSHIP COURSE.

BY ARTHUR T. FLUX,

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SCHOLARSHIP COURSE FOR DECEMBER 1905.

Eighth Month—August.

Work to be Prepared.

1. *Reading and Repetition.*—Regular daily practice must be taken in these subjects before a competent critic. Something far more than verbal correctness is required—in fact, this alone counts for little.

2. *Teaching.—The Teaching of Grammar.* Chap. viii., *Scholarship School Management.*

This subject is a valuable means of mental training. It does comparatively little towards helping a child to "speak and write correctly." In some few instances a knowledge of the laws of grammar may prevent a mistake, but usually the child speaks as do his parents and daily companions. The constant association with them, and the continual repetition of mistakes and idioms, has a more powerful effect than the occasional grammar lesson at school. The ordinary speech of the teacher is probably a much more powerful aid to correct expression, for children are great mimics, and unconsciously adopt the peculiarities of those with whom they are brought into contact. But, apart from the practical and utilitarian aspect of the subject, it is most valuable as a means of mental training. Starting with the correct assumption that grammar is the science of language, the science which investigates the rules, concords, &c., of what is in existence (for language existed before grammar), it is evident that, as in all other sciences, the greatest good will accrue from leading the child to ascertain for himself the laws and rules which constitute the text of grammar. Every lesson must be an exercise in induction or deduction, or the two combined. The regular process to adopt in any new lesson is—(*a*) a collection of suitable examples; (*b*) examination of the examples; (*c*) classification; (*d*) definition. If you give a child a bag of French coins, and tell him to sort them into heaps of the same kind, it is readily done, and a classification is arrived at by the use of observation and judgment, and it is hardly likely that the pupil would ever forget the various kinds, especially after the teacher had added a few words as to names and values. So with words, a child of average ability can, with a little aid, sort or classify the words into the recognised eight classes or parts of speech. Similarly with the classification of any single part of speech, *e.g.* kinds of adjective, the child must do the mental work of classifying. If the teacher supplies the definition at first, the greater part of the interest in the lesson is lost, there is little to look for.

Parsing is merely the application of what has been learnt, and is valuable because it causes the child to reason. He calls the word "book" a noun. Why? He arrives at the fact by reasoning in a syllogism. (*a*) The name of anything is a noun; (*b*) "book" is the name of something; (*c*) *therefore*, "book" is a noun. Correct parsing means, therefore, that the child has reasoned correctly for every statement made.

A few words of warning must be given to the young teacher. (1) Do not hurry. As scales on a piano have to be played slowly at first, and speed acquired with practice, so with the rules of grammar. Slow but correct work at first will inevitably lead to rapidity and ease. (2) Do not attempt too much in one lesson. Look at the matter from the child's point of view; although it is palpable and simple to you, it is not so to the scholars. In a Notes of Lesson on the Adjective, I have many times corrected notes with these heads, (1) definition, (2) kinds of adjective, (3) comparison, (4) irregularities, and the time allowed is thirty minutes! One glance at such notes shows that the writer has absolutely no teaching ability. If the adjective can be mastered in six to ten lessons it is as much as can be expected.

All notes should be arranged in steps (not in matter and method) as suggested above.

Step 1. Preparation or collection of suitable examples either by the teacher or the class.

Step 2. Examination of examples under the teacher's guidance.

Step 3. Classification or deduction.

Step 4. Definition given by class.

3. *Drawing.*—Two copies each week, one from a photograph of a cast, and the other from some natural object. Many of the copies sent show much improvement, but several do not satisfy the examination requirements—a large copy to fairly fill a half imperial sheet of paper, with clear smooth lines and just proportion. The last is a very important point; it is useless to commence filling in detail until the main lines are in correct position.

4. *Music.*—Tonic Sol-Fa. Chromatic names. Relative pitch of keys and notes.

The chromatic names present no difficulty. The relative pitch can be easily ascertained by constructing a modulator and counting the intervals, *e.g.* :—

Which of the following notes is highest in pitch and which one lowest?

(*a*) **f**^{1} in Key C.
(*b*) **r** in Key A.
(*c*) **m**^{1} in Key B♭.
(*d*) **t** in Key G.
(*e*) **s** in Key F.
(*f*) **f**$_{1}$ in Key E♭.

Write the scale of C so :—

s$_{1}$ **l**$_{1}$ **t**$_{1}$ **d** **r** **m** **f** **s** **l** **t** **d**^{1} **r**^{1} **m**^{1} **f**^{1} **s**^{1}

and proceed thus :—

(*a*) **f**^{1} in Key C is fixed by the scale—mark in the position by putting a small (*a*) over the note (see below).

(*b*) **r** in Key A. A = **l** **r** is a major second above **l** = **t**
(*c*) **m**^{1} in Key B♭. B♭ = **ta**^{1} **m**^{1} is a major third above **ta** = **r**^{1}
(*d*) **t** in Key G. G = **s** **t** is a major seventh above **s** = **fe**^{1}
(*e*) **s** in Key F. F = **f** **s** is a perfect fifth above **f** = **d**^{1}
(*f*) **f**$_{1}$ in Key E♭. E♭ = **ma** **f**$_{1}$ is a perfect fifth below **ma** = **la**^{1}

The line then appears :—

(*f*) (*b*) (*e*) (*c*) (*a*) (*d*)
s$_{1}$ **l**$_{1}$ **t**$_{1}$ **d** **r** **m** **f** **s** **l** **t** **d**^{1} **r**^{1} **m**^{1} **f**^{1} **s**^{1}

and hence it is evident that (*d*) is highest and (*f*) lowest. A few exercises worked like this will make the matter perfectly clear. Take care with the octave marks, *e.g.* **t** in Key B♭ is **l**^{1}, and not **l**.

5. *Penmanship.*—Write a page daily in the *Practical Teacher Copy Book*, and use great care at all times. The specimens submitted to me are generally poor, and would obtain only 50 to 70 per cent. of marks. The writing must be legible, free, and graceful.

6. *Composition.*—Write one or two essays each week on such subjects as:—

(*a*) The causes of the present discontent in Russia.
(*b*) The commercial status of the West Indies.
(*c*) What can be gained by the study of geography.
(*d*) The evils of war.
(*e*) School friendships.
(*f*) Compare the advantages and disadvantages of walking and bicycling as a means of making a holiday tour.
(*g*) Fairy tales.
(*h*) "A crowd is not company."

Read up the subject if necessary, and think well over the facts before commencing to work. Arrange your ideas in sections, and draw up a skeleton outline. It is useless to start and ramble on without any attempt at classification of ideas. Read the essay aloud when it is finished; the ear frequently detects faulty sentences and expressions which the eye has missed. The following hints may be of service.

(*a*) That Russia is seething with discontent is evident from the perusal of the various items of news which are permitted to reach us. The causes are largely the same as produced the French Revolution. The government is autocratic, the ukase of the Czar having the effect of law. In reality the whole government is in the hands of ministers, who are charged with being very corrupt. The peasantry are heavily taxed and have no voice in national affairs; they are very poorly educated, and according to Tolstoi, are perpetually hungry from the time of their birth till their death. Every attempt at agitation for reform is visited with severe punishment, and the country is kept quiet by brute force. This cannot continue: it is an anachronism, and belongs to the Middle Ages and not the twentieth century.

(*b*) The prosperity of the West Indies depends upon its vegetable products, for of mineral and animal wealth there is little. Before the emancipation of slaves, sugar was the staple product, labour was cheap, and there was a ready market. After the emancipation the freed slaves refused to work more than was necessary to obtain a bare living—not a difficult thing in tropical climes—and of recent years the manufacture of beet sugar and its export from the Continent to us has decreased the demand for cane sugar. Attempts have been made—with partial success—to provide cheap labour by the introduction of coolies from India, but it is doubtful whether sugar-growing will ever be anything like as profitable an industry as it was eighty years ago. Fruit is grown easily and quickly, and provided there were means of cheap and rapid delivery to cooler climates there would be a great demand for it.

(*c*) This is fairly obvious. Linked as we are with all parts of the world commercially, it is absolutely essential that we should be familiar with foreign countries. Two centuries ago England was largely self-supporting, but now we depend almost entirely on other lands to supply us with food and to take our manufactured goods.

(*d*) No assistance should be needed with this. The romance and glory are far outweighed by the awful misery not only on the battlefield, but in the home from which the breadwinner is withdrawn. This applies more forcibly in countries where there is compulsory service than in England. The enormous cost of war at the present time falls heavily upon the people in the shape of subsequent taxes; *e.g.* England is paying twenty-six or twenty-seven millions per annum interest on her debts which have been largely contracted in war-time. Imagine what could be done with this sum in the advance of education and the relief of the aged poor.

(*f*) This can only be dealt with adequately by one who has tried both means of locomotion. A walking tour only is possible in some countries where the roads are not suitable for cycles, but in most cases where there is a main road the greater part of it can be ridden, and cycling has all the advantages and none of the disadvantages of walking. It is as easy to stop and admire the scenery when riding as when walking, and a much wider tour may be taken in a given time. Of course the man who goes for a cycling tour with his nose on the handle-bar, and whose sole idea is to cover as many miles as possible, had better be at home chopping wood.

(*g*) The history of fairy tales is a fascinating study. They arose when the world was a very small place to its inhabitants, and meant only a mile or two from the village in which they lived. Outside and beyond was illimitable space, peopled by the imagination with all kinds of horrors. Destitute of all scientific knowledge, they regarded the phenomena of nature as being due to some supernatural agencies, to some spirits—good or bad—which had to be worshipped or propitiated. Anything which broke through the laws of nature as observed by them was due to the direct interposition of some unseen being—malignant or otherwise. The imagination had full play, and like children they saw wonders in everything unknown, and related the adventures with embellishments till the original and correct account was entirely obliterated. Thus the biblical incident of David and Goliath became ultimately Jack the Giant Killer, and the ordinary doings of some great personage, filtered across half a continent by word of mouth, were distorted into miracles. With the advance of exact knowledge the fairy tale has faded and only remains to amuse children, and even they are rapidly becoming sceptical.

(*h*) "A crowd is not company." The quotation should be continued, "and faces are like pictures in a gallery, and talk is but a tinkling cymbal when there is no love." Proximity without sympathy is nothing. In the crowded streets of a great city a man feels more lonely than with a single companion in a huge forest. In the latter case there is certainly one who is interested in what he says and does, in the former there is none. In the streets of London he may work or idle, eat or starve, wear broadcloth or rags, and no one cares.

7. *English.*—(1) Learn 15 roots and meanings each week.

(2) Words introduced into the language during the last two centuries.

(3) *Henry V.*, Act iv., Prologue and Scene 1.

(4) Prepare thoroughly the Essay on Studies.

(5) Read up the Rules of Punctuation.

Notes.—(1) The English vocabulary is always growing, accumulating words picked up and assimilated from the other languages of the earth. Our intimate commercial relations with all parts of the earth render this necessary. New ideas and terms are met with for which we have no equivalent, and the native word is appropriated. Men of science also are continually discovering new things to which they give new names, and these in the majority of cases are of classical origin. Public men and events also give rise to new terms—*e.g.* the exuberance of joy which was exhibited at the relief of Mafeking has given us a new word to "maffick," which, though not recognised as a standard word, is nevertheless continually used.

(2) The Prologue to the Fourth Act is one of the finest passages in Shakespeare, a powerful piece of word-painting which is inimitable in its clearness and completeness. The whole of this should be paraphrased two or three times. The "little touch of Harry in the night" is hardly less fine. His talk with the three soldiers is very natural, and his soliloquy upon his position exhibits the power of the dramatist to place himself in another's position and appreciate life from his standpoint.

(3) The Essay on Studies is perhaps the best known of the essays, and is an excellent example of Bacon's terse epigrammatic style. It is impossible to paraphrase any passage without using many more words than in the original. Each sentence is weighty and true, and note should be made of the antitheses employed throughout. The advice given should be thoroughly grasped and laid to heart by every student, for Bacon sees clearly that "abilities are like plants," which need proper treatment to bring them to maturity. How often is it the case that a student is weak in some subject simply because it has not been cultivated but entirely neglected.

(4) Clear and concise rules as to the use of the various stops should be entered in the note-book and committed to memory.

8. *Geography.*—(*a*) *Australia.* Physical Features, Climate and Productions.

(*b*) Revise the United States.

(*a*) In preparing the geography of Australia, draw a large outline map on a half imperial sheet of paper, and fill in all the details from the text-book as they occur, and go over them till thoroughly known.

The climate depends very largely upon the peculiar relief of the country—instead of a backbone of mountains there is a ring of elevation lying at a short distance from the coast, and a comparatively flat interior. The result of this may be deduced—there is considerable rainfall on the coast strip, but little in the interior. The winds as they pass over the hot sandy deserts become further heated, and thus absorb moisture instead of depositing it. The explorers who have penetrated the great deserts give graphic descriptions of the intense dryness. When the hot winds blow from the interior they are laden with a fine red dust—hence their name of "brick-dusters"—which in a few hours colours everything with a reddish hue. The chief feature of the climate is the droughts which occur, and do enormous

damage. These are frequently followed by floods. In many parts irrigation from the rivers and from artesian wells has been employed with very satisfactory results.

The productions must be divided carefully into (*a*) those which are indigenous, and (*b*) those which have been introduced. The country seems to have been definitely separated from Asia before the plants and animals common to the old world reached it by natural distribution. Hence Australia was singularly destitute of animals, especially the larger quadrupeds. Beyond the varieties of the marsupalia and a few rodents there were no large animals when the English first settled there. In the vegetable world the same peculiarities were found. There were many trees, mostly of the gum species, but no edible plants or fruits.

The plants and animals which have been introduced have thriven wonderfully. The ordinary European cereals flourish in the south, and sub-tropical trees and fruits in the north. Fruit-trees kill themselves by overcropping, and a brisk trade in the export of fruit has sprung up. The Scotch thistle grows into a small tree; watercress planted in streams develops stalks twenty feet long, and chokes up rivers. The rabbit, introduced for the sake of sport, has become a serious nuisance, and thousands of pounds are annually spent in attempting to exterminate it.

The native "fauna and flora" is a common topic for a question.

Australia is rich in minerals, and West Australia is the premier gold-producing colony.

The text-book will supply detailed accounts of the amounts of the various minerals produced, and these should be carefully studied.

The United States.—The same plan should be followed with regard to mapping. A clear idea of the general build of the country must be obtained—(1) the Atlantic slope; (2) the central prairie districts; (3) the plateau lying between the Rockies and the coast ranges; (4) the Pacific slope. This very largely affects the rivers, the climate, and productions. A peculiarity of the climate is the sudden change of temperature, especially in the central plains—blizzards from the north, or cyclones and heat waves from the south. A glance at the map will explain this; there is no barrier mountain range to protect the prairies from the cold winds sweeping down from the Arctic regions—the temperature will drop 50° or 60° in an hour—nor from the hot winds which originate in the Gulf of Mexico.

The rapid development and prosperity of the United States is continually paraded by Americans as evidence of the greatness of their nation, "the greatest on earth," if one may believe them; but they omit to notice that the greater part of the rapidity with which the country has grown is due not to man, but to nature. A splendid climate, notwithstanding its occasional eccentricities, magnificent waterways, and illimitable natural wealth have done more than the mere agency of man. The enormous forests, the rich prairies, the vast mineral wealth, and fertile soil are the main factors in the rapid advance.

Learn the chief railway routes, note imports and exports, the important towns, their exact position, and the industries carried on. A short history of the States is also necessary to a proper understanding of many geographical facts.

9. *History.*—Richard II. and Henry IV.

The reign of Richard II. brought about an important crisis in social affairs. To meet the expenses of the disastrous campaigns in France three poll-taxes were levied in quick succession, and this final oppression produced the outbreak known as the Peasants' Revolt. But it must be clearly understood that the taxation alone was but a small part of the grievances against which the commons of England protested. The origin lay much deeper, and to understand it we must go back to the Conquest, when the Saxon freeman became the serf or villein of the Norman baron. For three centuries he existed as a mere chattel, bound to the soil, living in mud huts, clothed with the coarsest raiment, and feeding on the commonest food. Hopes and aspirations he had none. Forced to work the greater part of his time for his master, he made a scanty livelihood from the few yards of land he was allowed for his own use. There was no inducement to work hard, there was no incentive to ambition; he was born a slave, and would remain one till his death. Even if he grew more corn than he needed, he must have it ground at his lord's mill, where it was heavily taxed, or sell it in a market where the market dues and tolls absorbed all profit. This was always keenly felt by the Saxon, who was, and is, essentially a lover of freedom. As the years rolled by events happened to accentuate this disgust with his position. The wars with France led to the enfranchisement of some, and they returned after the campaigns with wider views and a deeper dislike to the system of villenage. The Black Death which swept through the country carried off a large proportion of the labourers, and those left being in demand, required a higher wage. Against this the Statutes of Labourers were passed, fixing the rate of wages, and making the bonds of slavery still tighter. The teaching of Wycliffe was developed by his poor preachers into a vague Socialism—"If all men are equal before God, then they should be equal on earth." National pride was hurt at the loss of the French provinces after the heavy taxation to carry on the campaigns, and finally the unjust poll-tax brought matters to a head. These, briefly, were the causes—the case of Tyler was merely the incident which commenced the outbreak, and not the cause. Thousands of labourers would not have thrown off the control of the Government to avenge an insult to a villein's daughter—an incident too common in those times. The root of the matter is shown in the demands made:—

(*a*) The abolition of villenage; the right of every man to sell his labour where he could get most for it.

(*b*) General pardon.

(*c*) Liberty to buy and sell in free markets. [The market dues, as mentioned above, absorbed all profit.]

(*d*) Rent of land to be fixed at 4d. an acre. [This was not a wise demand as far as the price is concerned, but it contains a principle for the first time clearly enunciated, viz. that land should be let not for personal service, but for an adequate money payment.]

The attacks upon lawyers and the burning of records in the court-houses were to destroy documentary evidence of their serfdom. The Flemings were attacked because they were prosperous foreigners, and therefore objects of jealousy. The results were far-reaching. Although the promises of the young king were not kept, and many hundreds of rebels were put to death, the revolt brought about all that was desired. Villenage died, for landowners found it far more profitable to let their lands to tenant farmers for a fixed rental than to farm them themselves. The moral effect was also important. The baronage had regarded the villein as a negligible quantity, but now they had shown their power, they were henceforth treated with more consideration.

The rest of the reign is inglorious. The Lords Appellant and the Merciless Parliament must be noted, and the weak character of the king's rule, which brought about his downfall and death.

The Statute of Præmunire is another of those strong attempts to limit the power of the Church in England.

The growth of Lollardry must also be traced.

Henry IV. The nation, tired of the misrule of Richard II., deposed him, and placed Henry of Lancaster on the throne. He was not a usurper, since he was elected by the Parliament. To say that Roger Mortimer was rightful heir is hardly correct. He was the next in direct descent, but no law had been passed that the crown should descend by primogeniture. Henry was elected by the combination of Barons, Parliament, and Church. Each expected to be rewarded.

The Barons looked for a remission of some of the Feudal duties, and being disappointed with Henry's strong rule, rebelled on four occasions.

The Parliament claimed and obtained privileges:—

(*a*) Freedom of speech in Parliament.

(*b*) Control of the Royal Household.

(*c*) A permanent council of advice.

(*d*) The right to audit accounts.

(*e*) The Commons obtained the right to present money bills to the King without alteration by the Lords.

The Church as a reward for its support obtained the Statute *De Heretico Comburendo.*

10. *Arithmetic.*—Simple and Compound Interest. State and work simple interest by method of unity and do not use formulæ. Compound interest is best found by adding the interest each year; *e.g.*—find the compound interest on £3200 for 3 years at 5%.

5% is $\frac{1}{20}$ of the capital.

1st year	Principal =	3200		
„	Interest = $\frac{1}{20}$ of 3200 =	160		
2nd year	Principal =	3360		
„	Interest = $\frac{1}{20}$ of 3360 =	168		
3rd year	Principal =	3528		
„	Interest = $\frac{1}{20}$ of 3528 =	176	8	0
		3704	8	0
Deduct principal, and interest =		504	8	0

The following solutions have been asked for:—

1. A man stakes his property in four successive ventures. In the first he loses 40 per cent., in each of the others he gains

20 per cent. What percentage of profit remains on original outlay?

Assume the capital to be £1000.

1st transaction. He loses 40%, or £400.
Amount left = £600.

2nd " He gains 20% of 600 = 120.
Amount left = £720.

3rd " " 20% of 720 = 144.
Amount left = £864.

4th " " 20% of 864 = 172·8.
Amount left = £1036·8.

Therefore on 1000 there is a gain of 36·8.
" " 100 " " 3·68.

2. If I sell goods at a loss of 6¼ per cent., when I sell for £18, 15s. 0d., at what price must I sell to make a gain of 6¼ per cent.?

Assume cost price = 100. Then a loss of 6¼ = 93¾, and a gain of 6¼ = 106¼.

£18, 15s. 0d. corresponds with the 93¾. What does 106¼ represent?

As 93¾ : 106¼ :: £18, 15s. 0d., &c.

3. A milk dealer buys pure milk at 11½d. per gallon. How much water must he add that he may sell at 5d. a quart and obtain a gross profit of 100 per cent.

5d. per quart = 20d. per gall. If this is a gain of 100 per cent., the cost price was 10d. per gall. 10 pennyworth of milk

$$= \frac{10}{11\frac{1}{2}} \text{ gall.} = \frac{20}{23}.$$

Therefore he must have added 3 gallons of water to 20 gallons of milk.

4. If I sell a horse for £62 and a cow for £26, I gain 10 per cent. on the original cost of both; but if I sell the horse for £63 and the cow for its original price, I lose 10 per cent. Find original cost of each.

£62 + £26 = £88. This is $\frac{110}{100}$ of cost price, which equals £80.

In the second case 10 per cent. is lost, therefore the two are sold for £72.

Of this the horse is sold for £63, therefore the cow is sold for £9, the original price, and therefore the cost of the horse was £80 − 9 = £71.

11. *Algebra.*—Continued Exercise in Quadratics, especially surd equations. Surd equations are solved by squaring each side, separating the rational part from the surd, squaring again, &c., until the root signs are eliminated, *e.g.*

(1) $3x = 5 + \sqrt{(30x - 71)}$. Transfer the rational part to the other side.

$3x - 5 = \sqrt{(30x - 71)}$. Square.

$9x^2 - 30x + 25 = 30x - 71$.

$9x^2 - 60x + 9^4 = 0$, &c.

(2) $\sqrt{(2x + 9)} - \sqrt{(x + 4)} = 1$. Square.

$2x + 9 + x + 4 - 2\sqrt{(2x + 9)(x + 4)} = 1$, or

$3x + 12 = 2\sqrt{(2x + 9)(x + 4)}$. Square.

$9x^2 + 72x + 144 = 4(2x + 9)(x + 4)$,

&c.

(3) $2\sqrt{(2x + 3)} - \sqrt{(5x + 1)} = \sqrt{2(x - 1)}$. Square.

$4(2x + 3) + (5x + 1) - 4\sqrt{2x + 3}(5x + 1) = 2(x - 1)$, or

$8x + 12 + 5x + 1 - 4\sqrt{(2x + 3)(5x + 1)} = 2x - 2$. Transpose,

$11x + 15 = 4\sqrt{(2x + 3)(5x + 1)}$. Square.

$121x^2 + 330x + 225 = 16(2x + 3)(5x + 1)$,

&c.

Work the following paper:—

(1) $x + 2 = \sqrt{\{4 + x\sqrt{8 - x}\}}$. Ans. 0 − 1 − 8.

(2) $\sqrt{x} + \sqrt{x + 4} = \frac{2}{\sqrt{x}}$ Ans. ½.

(3) $\sqrt{(x^3 - a^3)} = 2 - \frac{1}{\sqrt{(x^3 - a^3)}}$. Ans. $\pm\sqrt{a^2 + 1}$.

(4) $2x^2 - 3\sqrt{(x^2 + 2x + 14)} + 4x - 49 = 0$.
Ans. 5, − 7, $-1 \pm \frac{1}{3}\sqrt{69}$.

(5) $\sqrt{(x - a)} + \sqrt{(x - b)} = \frac{b}{\sqrt{(x - a)}} + \frac{a}{\sqrt{(x - b)}}$. Ans. $a + b$.

(6) $\sqrt[3]{(a - x)} + \sqrt[3]{(x - b)} = \sqrt[3]{(a - b)}$. Ans. a. b.

Women.—Work any examples on the first four rules, and work the following paper:—

1. If $a = 1$, $b = 2$, $c = -3$, find the value of $6a + 3b + 4c$, and of $a^3 + b^3 + c^3 - 3abc$. Ans. 0. 0.

2. Simplify $3\{x - 2(y - z)\} - [4y + \{2y - (z - x)\}]$.
Ans. $2x - 2y + 72$.

3. What must be added to $(a + b + c)^2$ that the sum may be $(a - b - c)^2$. Ans. $-4ab - 4ac$.

4. Multiply $a^3 + b^3$ by $a - b$, and divide the result by $a + b$.
Ans. $a^3 - 2a^2b + 2ab^2 - b^3$.

5. Divide $x^3 + z^3$ by $x + z$, and from the result write down the quotient, when $(x + y)^3 + z^3$ is divided by $x + y + z$.
Ans. $x^2 - xz + z^2$; $(x + y)^2 - (x + y)z + z^2$.

6. Prove i. $(x + y)(x - y) + (y + z)(y - z) + (z + x)(z - x) = 0$.
(ii.) $(x - y)^2 + (y - z)^2 + (z + x)^2 = 2(x - y)(x - z) + 2(y - z)(y - x) + 2(z - x)(z - y)$.

12. *Euclid.*—Book I., Props. 35 to 4, with four deductions per week.

Women.—Props. 25–28, with two deductions per week.

13. *Science.*—The properties, method of occurrence, preparation, &c., of silicon, common salt, iron oxide, mercuric oxide. Arrange your note-book as indicated last month.

14. *Spelling.*—Learn 100 words per week from "Words Commonly Misspelt." Series C. or D.

Test Questions on the Month's Work.

1. *Penmanship.*—Write as specimens of copy-setting:—
(*a*) Large hand.—Little flowers.
(*b*) Small hand.—

"The fix'd sentinels almost receive
The secret whispers of each other's watch."

2. *English.*—(1) Paraphrase the following:—

"From camp to camp through the foul womb of night
The hum of either army stilly sounds;
But the fix'd sentinels almost receive
The secret whispers of each other's watch.
Fire answers fire, and through their paly flames
Each battle sees the other's umbered face;
Steed threatens steed, in high and boastful neighs,
Piercing the night's dull ear; and from the tents
The armourers, accomplishing the knights,
With busy hammers closing rivets up,
Give dreadful note of preparation."

(2) Analyse the following and parse words in italics:—
"*And because* the breath of flowers is far sweeter in the air (where it comes and goes like the warbling of music) than in the hand, therefore nothing is *more fit* for that delight *than to know* what *be* the flowers and plants that do *best* perfume the air."

(3) Write explanatory notes on the following.—Clove gilliflower—Bartholomew tide—Quince—Damascene—Pegasus—nook-shotten—lavoltas and corantos—He'll make your Paris Louvre shake for it.

(4) Give instances of words which may be used either as conjunctions or as prepositions, and explain how you will teach children to distinguish one from the other.

3. *Geography.*
(1) Describe clearly the government of the British West Indies.
(2) Draw a sketch map of Jamaica, and say what you can of its imports, exports, and towns.
(3) What do you understand by the scramble for Africa? Describe in outline the chief political divisions of the continent.
(4) Describe the whole course of either the Bahr el Abiad (White or True Nile) or the Zambesi.

4. *History.*

(1) How did Edward II.'s character influence the events of his reign?

(2) Describe with a plan the battles of Bannockburn, or Crecy, or Poitiers.

(3) What were the causes which brought about the Hundred Years War?

(4) Give some account of the state of England in the last year of Edward III.'s reign.

5. Work the following test paper in arithmetic:—

(1) By what fraction of a ton is $\left(\frac{3}{7}+\frac{9}{20}\right)$ of a cwt. greater than $\frac{5}{7}$ of $\frac{2}{9}$ of a quarter. Ans. $\frac{151}{3600}$.

(2) A publican having bought a barrel (36 gallons) of beer at 1s. 6d. per gall., less a discount of 2s., retails $\frac{1}{3}$ of it at 4d. a pint, and then fills up $\frac{1}{4}$ of the vacant space with water, and sells the mixture at the same price. How much per cent. does he gain on the barrel? Ans. 100 per cent.

(3) If a sixpenny loaf weighs 4·35 lbs. when wheat is at 5·75s. a bushel, what should be paid for 98·6 lbs. if wheat is 9·2s. per bushel? Ans. 181½s.

(4) A roof measuring 18 ft. along the ridge, and 10 ft. 8 ins. from ridge to eaves, has to be covered with slates 16 ins. long and 8 ins. broad, each slate overlapping the one below it by 2 ins. Find the cost of the slates at 16d. per doz.

Ans. £2, 14s. 0d.

(5) 3 partners gain £3650. The first advances $\frac{1}{3}$ of the capital for $\frac{1}{2}$ of the time; the second $\frac{1}{4}$ for one half the time; the third the remainder for the whole time. How should the profits be shared? Ans. £486, 13s. 4d.; £730; £2433, 6s. 8d.

(6) By selling 8 tons of tea at 1s. 6½d. per lb. a merchant loses 7½ per cent. At what price should he sell to gain 10 per cent.?

Ans. 1s. 10d. per lb.

6. How would you prepare carbon dioxide? Draw a diagram of the apparatus you would use, and say what experiments you would work to demonstrate its properties to a class.

PUPIL TEACHERS' COURSE

For Candidates' Examination, 1906.

Work to be Prepared.

1. *Reading and Repetition.*—Ten minutes' daily practice should be taken with these subjects, particular care being given to enunciation, proper modulation, and emphasis.

2. *English.*—(1) Learn ten roots and meanings each week from a good list.

(2) Prepare carefully the grammar of the adjective.

Learn a good definition. An adjective is a word which qualifies or limits a noun.

Prepare a careful classification:—

(1) Quality.

(2) Quantity: (*a*) Definite, (*b*) Indefinite.

(3) Demonstration or distinctions.

Note that adjectives of quality *qualify* a noun, the other classes *limit* or *point out*.

The rules for the comparison of adjectives. Regular and irregular comparison.

Adjectives which do not admit of comparison, *e.g.*—

(*a*) Demonstratives.

(*b*) Adjectives of definite number.

(*c*) Adjectives of quality—

—— nationality; French, English.

—— geometrical shape; square, circular, triangular.

—— periodicity; daily, annually, &c.

—— material; wooden, iron, golden.

—— which express a quality in the highest degrees; perfect, almighty.

Marmion.—Prepare canto ii., stanzas 18 to the end. Read up the meanings of all allusions and references. Be prepared to analyse any part and parse any word.

Write an essay each week on one of the following subjects:—

(*a*) Public gardens and parks.

(*b*) The daily newspaper.

(*c*) "Birds of a feather flock together."

(*d*) Our food supply.

Read up the subject if you do not know sufficient about it. In any case, think it well over before commencing to work. Draw up a skeleton plan and arrange your ideas in logical order. The following hints may help you:—

(*a*) Point out the necessity for fresh air, for a change from the bricks and mortar of the city. Show, that as many people cannot get to the country, the country must be brought to them. Notice the educational value of such places as well as their beneficial effects upon health.

(*b*) The daily newspaper—formerly a luxury—has now become a necessity to all those who wish to keep abreast of the times—to the business man, the writer, the student of geography and history, the sportsman, &c.

(*c*) Treat this as indicated last month; first, in its literal sense, then in its metaphorical significance.

(*d*) England does not produce a quarter of the articles used as food. To obtain what is needed we draw on the whole world. Take an ordinary breakfast. Tea, coffee, cocoa, flour from which bread is made, bacon, pepper, mustard, &c., from different quarters of the globe. Show, briefly, the countries which supply us with each commodity.

3. *History.*—The reigns of Henry I., Stephen, and Henry II.

Henry I.—Chief points:—

The charter—to secure the assistance of the English.

The invasion of Normandy—Battle of Tenchebrai.

The Investiture dispute with the Pope.

Stephen.—Note his claim to the throne—not a usurper, as he was elected by the Magnum Concilium.

The Civil War—Battle of the Standard.

The state of England during this unhappy contest.

Henry II.—A very important reign.

Henry's foreign possessions and how acquired.

The quarrel with Becket over the clerical courts. Note that Henry was right in his position, for offences against criminal law, a churchman should be punished as though he were a layman.

Constitutions of Clarendon.

So-called Conquest of Ireland.

Rebellion of his sons.

Legal reforms were very important.

(*a*) Restored peace and order.

(*b*) Introduced scutage.

(*c*) Introduced Justices in Eyre, or Itinerant Judges—a system which worked so well that it is still our method.

4. *Geography.*—Prepare thoroughly Norway, Sweden, Denmark, and Russia.

Draw a sketch map of each, inserting *all* the names to be remembered and no others. Repeat it until you can do it from memory. Note the following points:—

Norway.—The fiords, islands, industries, imports, exports, and towns. The change in the government recently made.

Sweden.—The rivers, industries (including the mining), chief towns, &c.

Denmark—with its island.—A purely pastoral country; very few manufactures.

Russia.—An empire; a collection of states. The ruler is the *Czar of All the Russias.* Note the rivers which wander over the great central plain, three-fifths of the country forests, the dreary tundras of the north, the black lands of the centre and south, the steppes. Minerals are common in the Urals. Petroleum at Baku. Country largely agricultural; people extremely poor and discontented. (See note under Scholarship Course.) Note imports and exports; chief towns. The government must be carefully studied. See that you can answer all the questions in "Test Questions," Meiklejohn and Holden.

5. *Arithmetic.*—Decimal Fractions. Note that decimals are merely a subdivision of fractions, where the denominator is 10 or some power of 10. The following points require particular attention:—

(1) Multiplication. Arrange the partial products so that the exact value of each line is shown.

Ex. 23·15 × 42·33 = 23·45

	43·3
	7·035
	46·90
	938·0
	991·935

(2) Division. Take care with the position of the decimal point. A common question is to ask the value of the remainder after dividing two or three times. *E.g.* What is the remainder after dividing 31·6234 by 1·21 to 2 places of decimals?

```
1·21 ) 31·6234 (
 121 ) 3162·340 ( 26·13
       242
       ---
       742
       726          See par. 153.
       ---
       16·3
       12·1
       ----
       4·24
       3·63
       ----
        ·61
```

The remainder is not 61 but ·0061, as will be readily seen by placing the decimal point in the proper place in the dividend and carrying the point down in each line.

(3) Recurring Decimals. Be prepared to answer the following:—

(*a*) What fractions may be expressed by a finite decimal, and why?

(*b*) When a vulgar fraction produces a recurring decimal, is there any limit to the number of digits recurring, and why? What is the greatest number you can have of recurring figures when reducing $\frac{1}{17}$ to a decimal fraction?

(*c*) Prove the rule for the conversion of recurring decimals into vulgar fractions.

(*d*) In what sense is $\dot{9}$ said to be equal to 1.

(4) In working such a sum as "Find the value of ·24565 tons," do not turn the decimal into a vulgar fraction. Proceed by reduction, thus—

```
·24565 tons
      20
      --
4·91300 cwt.
       4
       -
3·65280 qrs., &c.
```

(5) Note particularly the value of the sevenths—$\frac{1}{7}$, $\frac{2}{7}$, $\frac{3}{7}$, $\frac{4}{7}$, &c.

Any good text-book will explain all these points. If anything is not understood write for assistance.

6. *Algebra.*—Chapter iv., Hall and Knight.

7. *Geometry.*—Euclid, Book I. Propositions 9-12, with two deductions per week.

Practical.—Division of lines into equal parts and into proportional parts.

8. *Music.*—The length of notes as shown by their shape. Dotted notes. Tied notes. Though this is an optional subject, care should be taken with it. It is compulsory later on, and in any case marks can be easily obtained at the cost of very little trouble.

9. *Science.*—The Balance. Simple methods of finding the weight of 1 c.c. of different solids and liquids. Determination of density. The apparent weight of solids in liquids.

This is a very interesting section of the science. Nearly all the experiments can be worked provided the student obtains a balance and a set of metric weights. The density is always measured in comparison with an equal volume of pure water. The weight of solids in liquids depends upon the law of Archimedes. The decrease in the weight of a body immersed in water is always equal to the weight of the water displaced.

10. *Spelling.*—100 words weekly from "Words Commonly Misspelt."

11. *Penmanship.*—Write a page daily in the *Practical Teacher Copy Book*, and use great care at all times. This is usually a weak subject, because little trouble is taken to secure a good style, which is just as easy to write as a bad one.

Test Questions on Last Month's Work.

1. Write as specimens of copy-setting:—
   (1) Crystallise.
   (2) "Cheerful at morn he wakes from short repose."

2. Analyse the following, and parse words in italics:—

> "They closed around the fire,
> And all, in turn, essayed *to paint*
> The rival merits of their saint,
> A *theme* that ne'er *can* tire
> A holy maid, *for, be it known,*
> That their saint's honour *is their own.*"

3. (*a*) What is meant by Passive Voice? Give examples.
   (*b*) Give the past tense and past participle of each of the following verbs:—
   Rise, raise, sing, lie, sit, set, teach, get, give, hang.
   (*c*) What is an Auxiliary Verb? Give examples with explanations.

4. Work the following:—

(1) What quantity must be added to the difference of $5\frac{1}{3}$ and $9\frac{1}{12}$ such that if the sum be multiplied by $2\frac{1}{4}$ the product may be 28. Ans. $1\frac{1}{12}$.

(2) Simplify $\dfrac{9\frac{1}{2}\div 6\frac{1}{3}}{9\frac{1}{2}-6\frac{1}{3}} \div \dfrac{16\frac{2}{3}\div 11\frac{1}{4}}{16\frac{2}{3}+11\frac{1}{4}} \times 17\frac{3}{17}$. Ans. $156\frac{1}{4}\frac{3}{3}$.

(3) Find the difference between

$$\frac{\text{£2, 17s. 6d.}}{\text{£12, 18s. 9d.}} \text{ and } \frac{\text{2 cwt. 2 qrs. 10 lbs.}}{\text{12 cwt. 0 qrs. 19 lbs.}}$$ Ans. $\frac{1}{17}$.

(4) Express £$\frac{3}{5}$ − $\frac{3}{17}$ crown + $\frac{2}{3}$ shilling as the fraction of $\frac{4}{17}$ guinea + $4\frac{1}{2}$ florin. Ans. $\frac{2}{3}$.

(5) A man after spending $\frac{1}{2}$ of his money, then $\frac{1}{3}$ of the remainder, and then $\frac{1}{4}$ of what remained, had £25 left. How much had he at first? Ans. £100.

5. Point out the chief changes produced by the Norman Conquest.

6. What do you know of Doomsday Book, Curfew Bell, Feudal Aids, Salisbury Decree?

7. What were the Crusades? How was the object for which they were undertaken carried out?

8. What are the principal industries of Holland?

9. Where and what are Maas, Rotterdam, Liège, Namur, Antwerp, Stettin, Hartz?

10. Give an account of the government of Germany.

11. Write out the minor and major scales and their signatures.

12. What is the centre of gravity? How would you find it (*a*) in a piece of cardboard of uniform thickness, (*b*) in an equilateral triangle, (*c*) in a skeleton wire cube?

All communications connected with this Course must be addressed to ARTHUR T. FLUX, Oakleigh, Belvedere, and must be accompanied by the coupon of the current number, and a stamped addressed envelope if a reply is needed by post.

OUR CERTIFICATE COURSE FOR 1906.

BY GEORGE COLLAR, B.A., B.SC.,

Head-Master of Stockwell Pupil-Teacher School.

Test Questions on Last Month's Work.

THEORY OF TEACHING

1. Discuss the leading views of education, and give the opinions of authorities.

2. What are the chief points to be considered in drawing up a school time-table?

ENGLISH LANGUAGE AND LITERATURE.

1. Write a life of Milton from the time he left Cambridge.

2. What are the essentials of an epic poem? Show that *Paradise Lost* fulfils the necessary conditions.

3. Give an outline of the action of the Sixth Book.

ENGLISH HISTORY.

1. Which of the Roman Emperors visited Britain? Say what you can of the material remains of the Roman conquest of Britain.
2. Give a short account of the social and political institutions of the Anglo-Saxons.
3. Write a short account of *three* of the following: Anselm, Langton, Caractacus, Bede, Carausius.

GEOGRAPHY.

1. Give an account of the inland seas of Europe.
2. Write a description of the Rhine or Danube.
3. Trace the watershed of Europe from Cape Tarifa to the Ural Mountains.

ARITHMETIC.

1. Explain the method of Complementary Addition and say what are its advantages.
2. Divide 7431892 by 72, first by the Italian method and then by short division, using factors, and explaining how you obtain the final remainder.

ALGEBRA.

Explain, with illustrations, the differences between Arithmetic and Algebra.

GEOMETRY.

1. ABC and DBC are two isosceles triangles on the same base; prove that the angle ABD = the angle ACD.
2. Prove that if a triangle is equilateral it is also equiangular.

ELEMENTARY SCIENCE.

1. Describe a method by which you could show the relation between the area of a circle and the square on its radius.
2. Given that a metre = 39·37 inches, give the French measure equivalent to a cubic yard.

Syllabus and Notes for August.

ENGLISH COMPOSITION.

Prepare chap. iii., iv., and v. of the *Art of Writing English*, or Nesfield's *Senior Composition*, chap. iii., iv., and work all the exercises.

Prepare essays on the following subjects:—
1. Holidays.
2. Free trade.
3. Epic poetry.
4. The postal system.

THEORY OF TEACHING.

Study carefully Collar and Crook's *School Management*, chaps. v. and vi., on the general principles of education and on notes of lessons.

Many people now are in favour of notes drawn up on what is called the "five point system," from Herbart's theory. Whether the notes are arranged in two columns or are run on in paragraphs without columns, the teacher cannot expect to give a perfectly successful lesson unless he follows Herbart's five points. The first step in a lesson is the *preparation*, in which the teacher recalls to the children's minds such of their past experiences as will best enable them to take hold of the instruction which is coming. These experiences may consist of teaching they have had in previous lessons, or of their knowledge gained from their surroundings. In this way the "Preparation" step corresponds with the ordinary "Introduction," but with this difference, that while the "Preparation" is always an introduction to the lesson, we have seen many introductions which are in no way a preparation for the lesson. Now the effect of a lesson on a child's mind depends not merely on what is said and how it is said, but still more on the state of the child's mind when it is said. Thus a child was told that a "standard-bearer is a man who carries a flag." He at once replied that he had seen a standard-bearer—*in front of a steam-roller*. In this case the last five words gave an opportunity of correcting the wrong impression in the child's mind, but if pictures of knights or soldiers with flags had given a military colour to the child's ideas before the explanation of "standard-bearer" had been given, the result would have been different. With a little trouble the teacher will soon discover that he produces very different effects in different children although each child hears the same statement—the difference being caused by the difference in the content of the children's minds. Hence the first step in the lesson is the preparation. The next is the presentation of the new matter. In this the teacher follows the steps indicated in chap. v., and aims at getting the children to grasp the ideas with more and more definiteness, and leaves the words with which the ideas may be expressed by the child to the next step.

The third step is the "Formulation." In this the children are brought to express their ideas in clear and concise terms,—definitions are drawn up, and summaries of the facts taught are set out by the children under the teacher's guidance. A sort of formulation is generally found in the two-column form of notes, but it is relegated to the end under the name of "Black-board Summary," and is generally very imperfect.

As the teacher wishes the lesson to have a lasting effect and to be capable of recall when needed, "Association" is necessary. This constitutes the fourth step. The best way to remember a thing is to associate it with other things. "Link thought with thought" is one of the best maxims of those who wish to cultivate a good memory.

Finally the lesson must have an "Application." Children delight in doing exercises, and an exercise is necessary to clench the nail of knowledge which has been driven home by the four previous blows. In this section there is, of course, room for much variety: in arithmetic sums may be given; in grammar the exercise may take the form of parsing and analysis, or of picking out parts of speech from a passage in the reading-book; in an object-lesson the "application" may take the form of a composition exercise. In this case the application may often be considered as a separate lesson, following the object-lesson, and in case of a moral lesson, it is not easy for the teacher to supervise the application of his teaching, although in this case, more than in any other, if there is no application the lesson has been thrown away.

ENGLISH LITERATURE.

Prepare, in detail, *Paradise Lost*, Bk. VI., lines 1-353.

This book is a continuation of the episode in which Raphael relates to Adam and Eve the history of Satan's rebellion.

Line 2. *champaign*, collection of fields; from French *champs*, Latin *campus*, a field; compare "campaign," the part of a war during which the armies are in the field.

8. *Grateful vicissitude*, pleasing change. Milton is careful not to run counter to the statement, "There shall be no night there," but recognising the advantage of the alternation of times suitable for work and rest, he says that there is a similar change in heaven.

14. *Empyreal*. In the astronomical system of Ptolemy there are five heavens, the highest of which is the abode of God and consists of pure fire, hence its name—the Empyrean, from the Greek word *pyr*, fire. Hence Empyreal means belonging to the fifth heaven.

15. *Orient beams*, the rays of the rising sun. Latin *orior*, I rise.

19. *Procinct*, lit. girded before.

21. *To have reported*. As the reporting was present or future in relation to his thought, the present infinitive should have been used. The mistake is a very common one.

41. *who*. The antecedent "those" is omitted.

55. *their fall*. Note the figure—the deed put for the doer.

62. *In mighty quadrate joined*. A poetic expression meaning that they "formed a large square."

69. *Obvious hill*, a hill that came in the way. Latin *ob*, against, and *via*, a way. In *Samson*, Milton speaks of the eye as—

"So *obvious*, and so easy to be quenched."

70. *Straitening*, narrowing; notice it is not "straightening."

78. *terrene*, a tract of earth. Latin *terra*, earth.

81. *battailous aspect*, warlike appearance.

86. *Weened*, supposed. The word is connected with "win," and includes a certain idea of striving after.

90. *Fond and vain*, foolish and empty.

110. *Adamant*, hard steel.
119. *puissance*, power.
126. *Most reason is . . . overcome.* It is most reasonable, or right that reason should conquer. Notice the two meanings of the word "reason," and compare the French *avoir raison*, to be right.
132. *highth.* Milton forms the abstract noun by affixing *-th* to the adjective.
141. *Whelmed.* To whelm means to cover a thing by turning something over on to it. We generally use the compound, "overwhelm."
143. *there be who faith prefer.* Notice the omission of the antecedent to the relative. This is a very common idiom in Latin.
209. *brayed.* Either meaning of "bray" fits here. Bray may mean to bruise, strike, or pound in a mortar; it also means to make a roaring noise. "Arms on armour" suggests the former meaning, while "Horrible discord" suggests the latter. Compare—

"Heard ye the din of battle bray?"
—Gray's *Bard.*

212. *the dismal hiss.* Note the synecdoche; it was not the "hiss" that flew but the darts, which caused the hiss by flying.
232. *yet leader seemed . . .* Each single warrior seemed to act as though he was a skilled leader at the head of a troop.
239. *As only in his arm . . .* Each one relied on himself as if the victory depended on him alone.
282. *think.* This is in the imperative mood, hence there is no suffix in the 2nd pers. singular.
287. *that*=that which.
306. *Expectation.* Note the personification.
312. *Constellations*, groups of stars.
326. *But . . . side*, but turning in a swift circle, it entered deeply and cut all his right side. Compare *ploughshare, shears.*
329. *griding*, piercing, cutting through; compare—

"Through his thigh the mortal steele did gryde."
Faery Queene, II. viii. 36.

It is really the same word as *gird*, to strike or jest at, used also as a noun in the *Taming of the Shrew*, v. 2, 58.

"I thank thee for that gird, good Tranio."

335. *was run.* Notice the impersonal use of this verb.
346. *reins*, the kidneys. Latin *renes.* The word is often used to denote the inward, secret parts of the body, as in the Psalms: "Thou, O God, triest the very hearts and reins."
349. *fluid*, anything which will flow; hence gases, as well as liquids, are fluids.

English History.

Revise the outline of English History to the deposition of Richard II. The following are the chief points to prepare:—

1. Legislation and reforms of Edward I.
2. Conquest of Wales and Scotland by Edward I.
3. Abandonment of Scotland by Edward II.
4. Favourites of Edward II.
5. Edward III.'s claim to the French crown, and consequent war,—Sluys, Cressy, Calais, Invasion of the Scots and their defeat, Poitiers, Treaty of Bretigny.
6. Condition of the working-classes,—the Black Plague and consequent scarcity of labourers; the Statute of Labourers.
7. Expedition of the Black Prince in favour of Pedro of Castile, his victory at Navarette, his illness, the cruelty at the storming of Limoges.
8. Political influence of John of Gaunt; Alice Perrers. Reform movement headed by the Black Prince on his return to England. Death of the Black Prince, and recovery of power by John of Gaunt. Death of Edward III., and rivalry between his sons; proceedings in Richard II.'s early parliaments; dissension between the King and Parliament. Impeachment of the Earl of Suffolk—Ascendency of the Duke of Gloucester—Council of Regency—Regency overthrown—Death of Gloucester. Richard's expedition to Ireland. Return of Richard to England, where he finds Bolingbroke. Fall of Richard and Accession of Henry IV.
9. Social History of England during the reigns of Edward III. and Richard II. Rise of the pauper class, by the decay of villenage and growth of a class of free labourers not bound to the land. Legislation against mendicancy and vagabondage. The first Poor Laws, Black Death, risings of the peasants under Wat Tyler, &c.

Geography.

Finish the general physical geography of Europe, and study in detail that of the British Isles.

Arithmetic.

Prepare carefully the *New Arithmetic*, chapters xvii.-xix., and work as many of the examples as you can. Close attention must be paid to the theory, and logical proofs must be prepared. It is not sufficient to be able to work examples in arithmetic; the student must understand the principles and must be able to explain them to others. The most common mistake made in this matter is to work a particular example and suppose that thereby a *general* rule is proved. Some people run away with the idea that a general proof is not possible in arithmetic because the symbols are of fixed signification and not general or variable as in algebra. But it must be remembered that in geometry we have to use a particular figure to prove a general theorem. Thus if we wish to prove that the angles at the base of an isosceles triangle are always equal, as we cannot measure the angles at the base of every isosceles triangle we are bound to take one and base our proof on that. Now if we simply measured the angles and found them equal, we could not say that in every case the angles at the base of an isosceles triangle are equal, because we cannot tell whether this equality depended on the particular property of this triangle or on the properties common to the whole class. If, however, in dealing with the triangle we select as an example we are careful to base our arguments on the general properties of the class, then we can safely say that the conclusions we draw are applicable to the whole class. So in arithmetic we may prove a general rule from the consideration of a particular case, provided that we consider its common properties and not its particular properties. Thus, if asked to prove that every number which ends in 5 is divisible by 5, it is not sufficient to take a particular number, say 3765, and divide it by 5. We must show that this number, *like every number*, consists of a units digit and another part which is a multiple of 10 and therefore of 5. Consequently if both parts are divisible by 5, the whole is divisible by 5. The fallacy of dividing the particular number would be shown by trying to prove that every number ending in 7 is divisible by 7. Take, as an example, 147. On dividing this number by 7 there is no remainder. But the result in this case depends upon the fact that $147=140+7$, of which 140 is divisible by 7, but it is *not true* that all numbers formed by subtracting the units digits from others are divisible by 7. Hence the proof is not general.

Prepare the tests of divisibility and their proof. Note particularly the test of divisibility by 9, and the method of proving sums by "casting out the nines."

Algebra.

Work to the end of chapter x. in Hall and Knight. Prepare proofs of the theorems given, and do not be content to work out examples by rule of thumb. Many students can take terms out of brackets; but, because they do not understand the principles on which they work, they are unable to do the converse and put them into brackets. This is, however, very often useful; *e.g.* when related terms are to be treated as one quantity, particularly when the coefficients of a power of x have to be combined—

$$3x^3-ax^2-4x^2+3ax^2-bx^2+5x-7ax+cx$$
$$=(3-a)x^3-(4-3a+b)x^2+(5-7a+c)x.$$

One expression often contains the same terms as another, but with opposite signs. They will become identical by multiplying one by -1, or by putting the terms into a bracket with a minus sign in front.

$$(b-a)=-(-b+a)=-(a-b).$$

Notice that if each of two factors be multiplied by -1, the whole expression is multiplied by $(-1)\times(-1)$—that is, by $+1$—so its value is unchanged, although its form is modified.

$$(b-a)(c-a)=(a-b)(a-c).$$

Geometry.

Prepare the methods of drawing parallel straight lines and the theorems connected with parallel straight lines. Observe that a straight line drawn across two parallel straight lines forms

eight angles, of these four are exterior and four interior. See how many pairs of equal angles there are. With a knowledge of these equalities the following can be proved:—

(*a*) That the two interior angles on the same side are together equal to two right angles.

(*b*) That if one side of a triangle be produced the exterior angle is equal to the two interior and opposite angles, and the three interior angles of a triangle are together equal to two right angles.

(*c*) All the interior angles of any rectilineal figure together with four right angles are equal to twice as many right angles as the figure has sides.

N.B.—Conversely by deducting four right angles from twice as many right angles as the figure has sides, we obtain the sum of the interior angles, and if the figure is regular we have only to divide this sum by the number of sides and we have the size of each angle. This will enable the student to construct any regular polygon with the help of a protractor.

Example.—To construct a regular pentagon—*i.e.* a figure with five equal sides and five equal angles—

2×5 rt. angles $= 10$ rt. angles. $10 - 4 = 6$, and $6 \div 5 = 1\frac{1}{5}$.

Hence each angle of the figure will be equal to $1\frac{1}{5}$ right angle or 108°. So the pentagon may be constructed by taking a (given) line for the base, and drawing a line at 108° at each end. These lines can be made of the same length as the given line and lines drawn at 108° to the extremities of them. The last two lines should meet at 108° and be of the same length as the given line. This problem affords a test of the accuracy of the student's drawing. This test of accuracy becomes more and more severe the greater the number of sides to the figure. The problem may be simplified when the student has learnt how to draw a circle passing through three points.

(*d*) The opposite sides and angles of a parallelogram are equal and the diagonal bisects it.

Summarise the cases of congruency of triangles, and take the cases of inequalities in triangles.

General Elementary Science.

We omitted last month to mention the names of the Science text-books recommended. The most useful text-books for elementary physiography are: Cartwright's *Elementary Physiography* (T. Nelson & Sons); Gregory and Simmon's *Elementary Physiography* (Macmillan & Co.), and Brigg's *Elementary Science* (W. B. Clive).

Study the sections on *Forms of Matter*, *Matter at Rest*, and *Matter in Motion*.

Matter is generally considered to consist of three distinct forms—solid, liquid, and gas—and for all ordinary purposes these are sufficiently distinct and will admit of definition.

A solid is a body which has a definite shape and a definite size, and which will keep that shape and size without the help of pressure from the sides or from above; for example, stone, iron, wood.

A liquid is a body which has a definite size but no definite shape. It does not require to be completely enveloped to keep it from indefinitely expanding, but its shape is determined by that of the vessel into which it is poured; for example, water, mercury, spirits of wine.

A gas is a body which will expand indefinitely if not completely enveloped, and which, like a liquid, takes the shape of the vessel that contains it; for example, air, steam, carbon dioxide.

It must be observed that this classification is not a rigid one. Thus, a piece of cold glass is undoubtedly a solid, and white-hot glass is as certainly a liquid, but, unlike the change from ice to water, the change from solid to liquid glass is a gradual one, and it is impossible to fix a point at which the glass ceases to be solid and assumes the liquid state. So also it has been proved that under certain conditions of temperature and pressure a body may pass gradually from the liquid to the gaseous state, or *vice versâ*, without it being possible to say that the vessel contains both liquid and gas; that is to say, the whole mass may lose the gaseous and assume the liquid form.

Many substances may be met with in all three forms—*e.g.* water (as ice, water, and steam), sulphur, and carbon dioxide. Others may exist in two; thus, fats and sugar are known in the solid and liquid states, but any attempt to turn them into gases by heating them results in their decomposition, and although gases are given off from heated sugar those gases do not consist of sugar, but of something very different. Some substances may pass directly from the solid to the gaseous state—*e.g.* mercuric chloride—these are said to sublime.

One of the most important points about a gas is the relation between its volume and the pressure to which it is subjected. This relation was studied in this country by Robert Boyle and independently in France by Edme Mariotte, hence its statement is called the Law of Boyle or of Mariotte.

It is as follows: If the temperature of a gas be kept constant the volume of the gas varies inversely as the pressure to which it is subjected. The apparatus required to illustrate this law is very simple: two pieces of straight glass tubing may be taken, each about 2 feet long, and united by a piece of india-rubber tubing, also about 2 feet long. The end of one of the pieces of glass tubing is closed and a certain amount of mercury is poured into the open end of the other. On placing the two tubes side by side and adjusting their position, the surface of the mercury in the two tubes may be brought to the same level. The pressure of the air in the closed tube is now equal to that of the atmosphere. What this is exactly may be found by consulting the barometer. Let us suppose that it is 29 inches. The length of the column of air in the closed tube should now be measured; suppose it is 5 inches. The open tube may now be raised until the level of the mercury in it is, say, 4 inches above that in the closed tube; the pressure on the latter will then be $29+4$ inches, and on measuring the volume it will be found to be reduced to $\frac{5}{6}\frac{5}{3}$ of 5 inches. If we assume that the bore of the tube is uniform, the volume will be proportional to the length. Raise the open tube again, say until the mercury stands 8 inches higher than in the closed tube. The volume of the enclosed air will then be found to be reduced to $\frac{3}{4}\frac{3}{7}$ of 5 inches; *i.e.* the pressure being $\frac{4}{3}\frac{7}{3}$ of the original pressure, the volume becomes $\frac{3}{4}\frac{3}{7}$ of the original volume.

Matter at Rest.—Simple devices for gaining mechanical advantages. The simplest way to approach the study of the so-called mechanical powers or simple machines is to assume the truth of the law of conservation of energy. This states that energy, like matter, can neither be created or destroyed, and that the work given out by a machine is equal to the work put into it. Owing to friction a part of the work is converted into heat, so that the effective work done by any machine is only a part of the work put into it. As this introduces very intricate calculations, it is usual to assume that the machine considered works without friction, and hence all the work put into the machine is given out again as work. Now mechanical work is measured by the product of the number of units of force into the number of units of length through which it acts. In any problem, therefore, we must take the same units of force and the same units of length. If we take the pound as the unit of force and the foot as the unit of length, the unit of work is the foot-pound.

Let us consider first the case of the lever. It is quite immaterial in which position the fulcrum, power, and weight are respectively placed. We measure in each case the distance from the fulcrum, or turning point, to the points at which the Power and Weight respectively act. By the principle of similar triangles or similar segments of circles the distances through which the Power and Weight act are directly proportional to the radii of the circles they describe, and hence the Power and Weight must be inversely proportional to these radii, because the product of the force P into the distance through which it acts is equal to the product of the force W into the distance through which it acts. For example, if the lever is 4 feet long and the fulcrum 1 foot from the end P, then P's arm is 1 foot and W's arm is 3 feet. Consequently, if W move through 1 foot P will move $\frac{1}{3}$ foot and as $P \times \frac{1}{3}$ is the work put into the lever and $W \times 1$ is the work done by it, it follows that $P \times \frac{1}{3} = W \times 1$ or $P = 3W$.

The same will be found to be the case in levers of the second and third order.

In the wheel and axle the forces may be supposed to act at the ends of the radii, and these two radii may be considered as forming a lever of the first order. If a man working a capstan describes a circle of 8 feet radius, and the radius of the hub of the capstan is 6 inches, the length of rope wound up in a given time will be one-sixteenth of the distance the man walks, but the tension in the rope—*i.e.* the force with which it pulls—will be sixteen times as great as that with which the man pushes the bar.

In the case of a single fixed pulley P and W are equal and move through the same distance. In that of a single movable pulley P has to move twice as far as W, because two ropes have to be shortened, hence $W = 2P$.

The different systems of pulleys are all easily understood if the distances moved by P and W are first estimated.

OUR QUERY COLUMN

RULES.

1. Each correspondent is restricted to *one* question.
2. Each query must be accompanied by the name and address of the correspondent, and the *coupon* which appears on the back wrapper of the current number of the Journal.
3. CORRESPONDENTS MUST IN ALL CASES STATE THE SOURCE FROM WHICH THEIR QUERY HAS BEEN OBTAINED.

The Editor reserves to himself the right to decline to answer any question which is, in his judgment, unsuited to the Magazine.

Reply to Scamp.—A very suitable method of treatment for burns caused by phosphorus or hot concentrated sulphuric acid is the following :—

Wash well with water to remove the phosphoric acid or sulphuric acid, bathe the injured part for a few minutes in lime water to neutralise any acid which may remain in the wound. Sprinkle on the sore a little iodoform, and if the skin is not broken, rub very gently with vaseline, taking care not to injure the skin. If the burn is very severe or the skin broken do not rub on the vaseline, but spread a quantity of vaseline on a piece of linen and apply gently to the wound.

In reply to the second part of your query, the phosphorus is not likely to get into the blood in sufficient quantity to do any harm in the way you suggest.

Sinew.—A steady stream of water flowing at the rate of 500 grammes per minute through a glass tube 30 centimetres long, 1 centimetre in external diameter, and 8 millimetres in bore, the outside of which is surrounded by steam at a pressure of 760 millimetres, is raised in temperature from 20° to 30° C. as it passes through the tube. Find approximately the thermal conductivity of the glass in calories per square centimetre per second for a temperature gradient of 1° C. per centimetre.

(S. & A. D. (Adv.), 1900.)

Using the formula

$$Q=k\frac{A\theta t}{x},$$

where Q is the quantity of heat in calories which passes in time t seconds per area A square centimetres of glass of thickness x centimetres, θ the difference in temperature of opposite forces of the area A, and k the required thermal conductivity, we see by the question that when t is unity, $Q=\frac{500}{60}\times 10$ calories $=\frac{250}{3}$ calories. Also A the area being taken as approximately equal to the product of length of tube into mean circumference, we have $A=30\times 0{\cdot}9\pi$ square centimetres; $x=0{\cdot}1$ centimetre. Again, θ may be taken as the difference between 100° C. and the mean of 20° to 30° C. or 75° C. Hence we have

$$\frac{250}{3}=k\frac{30\times 0{\cdot}9\pi\times 75}{0{\cdot}1};$$

$$\therefore k=\frac{250}{3}\times\frac{1}{270\pi}\times\frac{1}{75}$$

$$=\frac{1}{9\times 27\pi}$$

$$=0{\cdot}0013, \text{ nearly.}$$

Pen.—Three forces in equilibrium act from the centre of the circumscribing circle of a triangle towards the angular points. Find the ratio of the forces in terms of the sides of the triangle.

Let ABC be the triangle and O the centre of the circumscribing circle. Let the force acting along OA be represented by P_A, that acting along OB by P_B, and the force acting along OC by P_C.

Then, since P , P_B, and P_C are in equilibrium, we have

$$P_A : P_B : P_C = \sin BOC : \sin COA : \sin AOB.$$

But $\angle BOC = 2\angle A$, $\angle COA = 2\angle B$, and $\angle AOB = 2\angle C$;

$$\therefore P_A : P_B : P_C = \sin 2A : \sin 2B : \sin 2C$$

$$= 2\sin A\cos A : 2\sin B\cos B : 2\sin C\cos C$$

$$= a\cos A : b\cos B : c\cos C.$$

But $\cos A=\frac{b^2+c^2-a^2}{2bc}$, $\cos B=\frac{c^2+a^2-b^2}{2ca}$, $\cos C=\frac{a^2+b^2-c^2}{2ab}$;

$$\therefore P_A : P_B : P_C = a\cdot\frac{b^2+c^2-a^2}{2bc} : b\cdot\frac{c^2+a^2-b^2}{2ca} : c\cdot\frac{a^2+b^2-c^2}{2ab}$$

$$=\frac{a^2(b^2+c^2-a^2)}{2abc} : \frac{b^2(c^2+a^2-b^2)}{2abc} : \frac{c^2(a^2+b^2-c^2)}{2abc}$$

$$=a^2(b^2+c^2-a^2) : b^2(c^2+a^2-b^2) : c^2(a^2+b^2-c^2).$$

Fidelis.—ABC is a triangle. Find the resultant of forces at A represented in magnitude and direction and sense by 4AB, 5AC, 6BC. (Tutorial Statics.)

The given forces are obviously equivalent to the forces 4AB, 4BC, 4CA, 9AC, 2BC. Since the forces AB, BC, CA, acting at the point A, are represented by the sides of a triangle taken in order, the resultant of these three forces is zero. Therefore the resultant of the three forces 4AB, 4BC, 4CA is zero. Hence the given forces reduce to 9AC, 2BC.

On BC produced take CP equal to $\frac{2}{3}$BC and join AP. Then by the triangle of forces AP is the resultant of AC and $\frac{2}{3}$BC. Hence 9AP is the resultant of the forces 9AC, 2BC. But we have seen that 9AC, 2BC are equivalent to the given forces. Therefore 9AP is the resultant of forces at A represented in magnitude and direction and sense by the given forces 4AB, 5AC, 6BC.

Bike.—Two balls, each weighing 10 lbs., are attached to the ends of two uniform rods AB, AC, each 2 feet long and 4 lbs. weight, which are welded together at A at an angle of 60°. Another rod AO, 1 foot long and 2 lbs. weight, is welded to them so as to bisect the angle between them. Show that the system will balance on the lower end O of this rod as a pivot so that A shall be above O; and find what force applied horizontally at A would be required to push that point sideways through 2 inches.

(Inter. (London), 1897.)

It is obvious that the centre of gravity of the system lies in AO or AO produced. Let $\bar{y}$ denote the distance of the centre of gravity of the system in feet from the point A. Then the sum of the products of each of the masses into the distance of its centre of gravity from a horizontal plane through the point A is equal to the product of the sum of the masses into the distance of the centre of gravity of the system from the same plane.

Hence we have

$$(10+4+2+4+10)\bar{y}=2(10\times 2\cos 30°+4\times 1\cos 30°)+2\times 0{\cdot}5;$$

$$\therefore 30\bar{y}=2(24\cos 30°)+1;$$

$$\therefore \bar{y}=\frac{12\sqrt{3}+0{\cdot}5}{15};$$

$$\therefore \bar{y}=\frac{21{\cdot}284}{15}=1{\cdot}419.$$

The centre of gravity of the system is therefore $(1{\cdot}419-1)$ feet below the point O. The system will therefore balance on the end O of AO as a pivot.

When A is pushed sideways through 2 inches by a horizontal force applied at A, let θ denote the angle AO makes with the vertical, and let F be the required force. Then taking moments about O we have

$$30\times 0{\cdot}419\sin\theta=F\times 1\cos\theta.$$

But $\sin\theta=\frac{2}{12}=\frac{1}{6}$ and $\cos\theta=\frac{\sqrt{140}}{12}=\frac{\sqrt{35}}{6}$;

$$\therefore \frac{\sqrt{35}}{6}F=30\times 0{\cdot}419\times\frac{1}{6};$$

$$\therefore F=\frac{30\times 0{\cdot}419\times\sqrt{35}}{35};$$

$$\therefore F=\frac{2{\cdot}514\times\sqrt{35}}{7};$$

$$\therefore F=2{\cdot}124 \text{ lbs.}$$

OUR SCIENCE SECTION

☞ **Subscribers requiring Explanations of Difficulties in any branch of Science, or Advice upon Courses of Study, can obtain all help required by communicating with the Editor, and accompanying their query with the Coupon cut from this number.**

CHEMISTRY.

(ADVANCED AND HONOURS.)

BY C. A. WEST, B.SC., A.R.C.S., F.I.C.

Quartz Helium Thermometers.—Some time ago it was proposed to construct thermometers for the measurement of high temperatures from quartz and helium. It was proposed to measure the temperatures by means of the expansion of helium in vessels made from quartz. It has been found, however, that quartz is permeable to helium and especially at high temperatures. The rate at which helium diffuses through the walls of the quartz vessel is found to be proportional to the pressure of the gas. At 1100° C. it is very rapid, and at 220° C. it is quite perceptible.

Reduction of Potassium Perchlorate.—When potassium perchlorate is boiled in aqueous solution with ferrous oxide in the absence of free alkali, it is reduced quantitatively to potassium chloride.

Crystallisation of Plastic Sulphur.—J. H. Kastle and W. P. Kelly have made a series of observations on the crystallisation of plastic sulphur.

A specimen of sulphur was heated to 200° and poured into cold water; one portion was left in water at the ordinary temperature, whilst another was kept in water at 70°; the sp. gr. of each was determined at intervals of an hour. In another experiment, the sulphur was heated to 444° before being poured into water; portions of this specimen were kept at 80°, 60°, and 40° respectively, whilst another portion was left in cold water; the sp. gr. was determined at intervals in each case. The results indicate that the rate of change of plastic into crystalline sulphur varies according to the temperature to which the sulphur is heated before being poured into water, and also with the temperature at which the product is preserved. The higher the initial temperature to which the sulphur is heated, the slower is the crystallisation; and the higher the temperature at which the sulphur is kept, the more rapid is the change.

In another series of experiments, a specimen of plastic sulphur was divided into five portions, which were kept under water, dilute ammonia, 95 per cent. alcohol, dilute bromine water, and N/10 iodine solution respectively, the sp. gr. being determined at intervals in each case. It was found that ammonia, alcohol, and bromine accelerate, whilst iodine retards, the crystallisation.

A study of the effect of heat has shown that plastic sulphur has no definite melting point, the effect of any increase of temperature being merely to diminish its viscosity and to increase its tendency to pass into the crystalline form.

The stability of any particular specimen of plastic sulphur can be judged from its colour; light amber-coloured specimens crystallise easily, whilst reddish-brown varieties remain plastic for longer periods. Experiments have shown that when the plastic and orthorhombic forms of sulphur are heated at 120–125° for a sufficient length of time they become alike in colour, a state of chemical equilibrium being ultimately reached in each case.

Experiments made with the object of determining the effect of tension on the crystallisation showed that specimens of sulphur under tension crystallise more rapidly than those not under tension.

Determinations of the rate of change by the dilatometric method showed that plastic sulphur prepared by pouring into water sulphur that has been heated only to a moderately high temperature crystallises rapidly, whereas that which has been heated to near the boiling point before being poured into water crystallises very slowly. The velocity of the change of plastic into crystalline sulphur begins comparatively rapidly, about 10 per cent. of the total change taking place in the first thirty minutes, and then gradually diminishes. This gradual decrease in the rate of crystallisation indicates that several molecular forms are present in the super-cooled liquid, some of which change to the crystalline variety of the element more rapidly than others.

Formation of Perborates.—When an intimate mixture of 248 grams. of boric acid and 78 grams. of sodium peroxide is gradually added to 2 litres of cold water, a clear solution is first obtained from which the perborate, $Na_2B_4O_8$, $10H_2O$, crystallises after a time in 90 per cent. yield.

The aqueous solution of the perborate contains free hydrogen peroxide. Its solubility at 11°, 22°, and 32° has been found to be 42, 71, and 138 grams. per litre. The perborate cannot be recrystallised from its aqueous solution.

When a quantity of hydrochloric acid equivalent to half the sodium in the perborate is added to this solution, a perborate, $NaBO_3$, $4H_2O$, separates in the form of white crystals which are very stable at the ordinary temperature and are not affected by atmospheric carbon dioxide. This salt is less soluble than the first perborate; its aqueous solution slowly decomposes at 50°–60° and evolves oxygen rapidly at 100°. The solution has all the properties of hydrogen peroxide, and on account of its stability in the air the crystalline salt may conveniently be used as a means of obtaining an aqueous solution of hydrogen peroxide.

Reaction Products of Sodamide.—W. P. Winter has recently published in the *Journal of the American Chemical Society* an account of some experiments carried out with sodamide. When sodamide is exposed to dry air, it slowly assumes a yellowish-brown colour and is found to contain nitrous and hyponitrous acids. When sodamide is decomposed by water, hydrogen and nitrogen are produced.

The relative proportions of these gases vary with the condition of the sodamide. It has been found that the proportion of hydrogen is high in the case of sodamide which has been insufficiently heated owing to the presence of unchanged sodium, but is low when the sodamide has been properly prepared.

Nitrogen is always evolved to a small extent and is formed in larger proportion from sodamide which has been kept for some time than from freshly prepared specimens.

The production of the nitrogen is probably due to the presence in the sodamide of sodium azoimide or some analogous compound formed by oxidation of ammonia either in the process of manufacture of the sodamide or during its exposure to dry air.

If finely powdered sodamide is sprinkled into a vessel containing water heated nearly to boiling through which a current of carbon dioxide is being passed, a shower of brilliant sparks is produced and a solution of disodium cyanamide is formed. When sodamide is treated with phosphorus pentachloride, a violent reaction takes place, and a white sublimate is produced, which consists of ammonium chloride, sodium chloride, traces of phosphorus compounds, and a small quantity of a substance insoluble in water. This insoluble compound cannot be isolated, but when the soluble substances are removed from the sublimate by means of nitric or acetic acid, a white, nearly tasteless, odourless compound, PO_2N or PH_2O_2N, is obtained, which is not affected by hot strong mineral acids.

When sodamide is warmed with yellow phosphorus, an energetic reaction occurs, and the product consists of sodium phosphide and other substances, including oxy-acids of phosphorus and probably an amide of phosphorus.

Volatility of Platinum.—G. A. Hulett and H. W. Berger have carried out a series of experiments with the object of determining the conditions under which platinum is volatilised. A large sheet of platinum foil was heated by means of an electric furnace and the loss in weight determined at intervals. In order to ascertain whether the volatilisation was influenced by the impurities present, some experiments were made with a specimen of platinum of a high degree of purity; the results showed that the pure platinum behaved in the same way as the foil.

Platinum begins to volatilise in air at a temperature of about 800°, and the rate of loss increases rapidly as the temperature rises. No volatilisation occurs when the metal is heated in the absence of oxygen, and it is suggested, therefore, that at high temperatures the platinum is converted into a volatile oxide which undergoes decomposition at temperatures below 800°.

NOTE.—*Next month we shall commence the study of the Dissociation Hypothesis.*

PHYSIOGRAPHY.

(STAGES 2 AND 3.)

THE THERMOMETER

ANY instrument used for the measurement of temperatures may be spoken of as a thermometer. In the designing of most thermometers we take advantage of the difference in the thermal expansions of two substances.

The great majority of thermometers consist of a liquid (usually mercury or alcohol) enclosed in a narrow bore tube with a bulb at one end and a scale on or behind the tube for reading the position of the end of the narrow column of liquid in the tube.

When the temperature of the thermometer is raised the liquid expands more than the glass. (If the glass and liquid expanded at the same rate the position of the end of the liquid column would not change relatively to the scale on the stem.) If both the glass and the liquid expand regularly, and the bore of the tube is uniform, then equal rises in temperature will cause equal rises in the height of the liquid in the stem, and this enables us to compare the rise in temperature during any observation with the rise during any other observation. If we wish to actually measure temperatures by means of a thermometer we must have a definite temperature from which to measure, for the thermometer really only shows differences in temperatures. In addition we must fix on a definite scale of temperatures. Both the standard temperature and the scale divisions may be quite arbitrary. The standard temperature which is practically universally adopted is the temperature of melting ice. This temperature was originally adopted because it used to be thought that the melting point of ice was absolutely constant. We now know, however, that the temperature at which ice melts depends on the pressure to which it is subjected. The knowledge of the reduction of the melting point of ice by pressure was first deduced from theoretical considerations by Professor James Thomson. The theoretical deductions were afterwards verified experimentally by Sir William Thomson (brother of Professor James Thomson and now Lord Kelvin). Professor Dewar has also verified Lord Kelvin's results, and it is found experimentally that the melting point of ice is lowered 0·0072° C. per atmosphere increase of pressure. Obviously any changes produced in the melting point of ice by any change in the barometric pressure will be negligible for all practical purposes. Hence although the idea that the melting point of ice is fixed is not absolutely correct, still for practical thermometry we may assume that it is so.

Another standard temperature which is made use of is the boiling point of water under normal pressure. It is well known that the boiling point of water is not a fixed temperature, but that it changes considerably with changes in pressure. In a steam boiler we may have water boiling at a very much higher temperature than that at which it boils under normal pressure. (A change of one inch in the height of the barometer produces a change of approximately 1° C. in the boiling point of water.) However, at any particular pressure the boiling point is constant. Now the second standard temperature (which again is universally adopted) is the boiling point of water under a pressure of 760 mm. of mercury. These two standard temperatures are spoken of as the freezing point and boiling point respectively.

With regard to a thermometric scale, several have been employed. Two are in general use in England. One of these is the Fahrenheit scale, in which the freezing point is taken as 32 and the boiling point as 212. The range of temperature between these two is consequently divided into 180 equal degrees. The scale below the freezing point is also divided into degrees equal to these. Thirty-two degrees below the freezing point is then the zero on the Fahrenheit scale. This temperature was taken as zero by Fahrenheit because he thought it was the lowest temperature attainable. (It was the lowest temperature he was able to obtain by a certain mixture of ice and salt.) This scale is still used largely for recording the results of meteorological observations and for commerical work, especially in England.

Another scale which is used all over the world for scientific purposes and in many countries for all purposes is the Centigrade scale. On this scale the freezing point of water is taken as zero, and the boiling point of water under a pressure of 760 mm. of mercury is defined as 100°, and the range of temperature between these two fixed points is divided into 100 equal degrees. Below zero and above the boiling point the scale is continued in degrees equal to those between the two fixed points.

In constructing an ordinary mercurial thermometer and in graduating and calibrating it a number of points have to be taken into consideration.

If the thermometer is to be a sensitive one, that is, if it is to indicate small fractions of a degree, then we must select a tube with a fine bore and a large bulb. It will be obvious that the finer the bore and the larger the bulb the greater will be the relative motion of the end of the thread of mercury in the stem. However, as it is important in making a measurement not to alter the thing measured more than we can help, and we can only measure the temperature of a body by transferring some of its heat to the thermometer, it is essential that the quantity thus transferred shall be but a small fraction of the whole, therefore for most purposes it is not advisable to make the bulb very large, and therefore for very delicate thermometers we resort to a very fine bore. Now after a bulb is blown on the end of a thermometer tube it contracts as it cools. The contraction does not stop, however, when it has become cold, but continues slowly and gradually for months, and in some cases it is appreciable even after a year has elapsed. Hence it is usual in constructing good thermometers to use bulbs which have been made for a considerable time.

If great precision is required in the thermometer, it does not do to assume that the bore of the tube is uniform, but a very simple test will suffice to show whether the bore is uniform, and to calibrate it so that lengths representing the same volume may be marked off. A small quantity of mercury is introduced into the tube and moved along either by forcing air in behind it with an india-rubber ball or by drawing out air from before it with the mouth. The ball is preferable as it avoids the risk of introducing moisture into the tube. The lengths occupied by this small drop of mercury in different parts of the tube are measured. If they are found to be equalthe bore is uniform, but if not, then the space allowed for a degree in the different parts of the tube must be proportional to the space occupied by this drop of mercury. This method was invented by Gay-Lussac, and if the whole tube is divided off into equal volumes in this way the relation between this volume and a degree can easily be found by comparison with a standard thermometer when the instrument is finished.

The tube is filled by blowing a little cup at the end remote from the bulb. This is filled with mercury and the bulb heated. The heated air expands and some of it escapes, and on cooling the pressure of the air on the cup causes some of the mercury to run down into its place in the bulb. This is now heated until the mercury in the bulb boils, and the escaping mercury vapour carries the air with it. On again cooling the bulb becomes completely full of mercury, or if not it can be boiled again.

(To be continued.)

New School Books

THE Preacher truly says, "Of making many books there is no end," and the saying is forcibly driven home to the Editor by the large number of educational books sent in for review. The need for keeping up to date in the matter of educational publications should at all times secure a careful perusal of the columns of book notices, which represent the result of a large amount of difficult work on the part of the Editor and numerous expert assistants. The present month seems especially opportune for calling attention to new school books, as the new school year, which begins after the holidays, is a fitting time for the revision of the books in use.

ALLMAN & SON, NEW OXFORD STREET, LONDON, W.

The Lay of the Last Minstrel. Edited by W. J. Addis, B.A. Scott's poem presents difficulties from its allusions and from the irregularities in its metre. Both of these are effectively dealt with in the notes given in this edition.

AMERICAN BOOK COMPANY.

La Chute. Par Victor Hugo. With introduction, notes, and vocabulary by V. E. Kapp, Cherokee, Iowa. This book contains the opening chapters of *Les Misérables*, and leads up to the point where Jean Valjean, crushed, and with the dawn of repentance in his soul, is found in an attitude of prayer before the door of the saintly Bishop Bienvenu. It is got up in the perfect style the American Book Company has accustomed us to. The notes are good, and not too obtrusive, and the vocabulary appears to contain all the words the student is likely to want.

G. W. BACON AND CO., LTD., 127 STRAND, LONDON.

"Excelsior" Upper Class Atlases—British Isles, Europe, The Colonies. These books ought to be exceedingly popular. They show, on opening, a map and the geography of the same country. The maps are clear, while the text is full and explicit. Used judiciously with corresponding wall maps, a class ought to make rapid and substantial progress.

"Excelsior" Memory Map-Atlas.—This is one of the best atlases of its kind that we have seen. The maps are clearly printed with bold outlines, and there are just sufficient features inserted to make it easy to retain them in the visual memory. The printing of the course of the river in blue is a good idea. At the bottom of each map are directions for drawing it, and facing it is a page of well-arranged text giving general information about the country it represents.

GEORGE BELL AND SONS, YORK HOUSE, PORTUGAL STREET, LONDON, E.C.

Bell's Miniature Series. Chopin. By Ernest J. Oldmeadow. The writer of this interesting little book has taken great pains to sift out from a mass of contradictory statements that have centred round the life of Chopin, the facts that may be accepted as authentic. These, together with an appreciation of him as *Musician*, are put before the reader in a delightful manner.

Schumann. By Ernest J. Oldmeadow. The story of the musician's life is simply told, and there is a thoughtful appreciation of the work of the great leader of the Romantic school of music.

Brahms. By Herbert Antcliffe. It is difficult to account for the comparative want of appreciation that this genius enjoys in England. It is to be hoped that this admirably written little biography will do something to induce English people to take up the study of his works.

Chaucer. By Rev. W. Tuckwell, M.A. Here we have an excellent account of our great poet, and we trust that the suggestive chapter on the way to read Chaucer will tempt many to read his poems.

Coleridge. By Richard Garnett. As might be expected from a critic of Dr. Garnett's learning, we have here a monograph which is a valuable addition to the history of English literature. In the "Critical Estimate," the writer is not carried away by a blind worship, but carefully discriminates between the different sections of the poet's work, and shows in what points they are more or less deserving of admiration.

The York Readers—Book II. A delightful reader, containing lessons of endless variety, some of which deal with Nature in an interesting way. Well printed and illustrated.

ADAM AND CHARLES BLACK, SOHO SQUARE, LONDON, W.

The "Council" Arithmetic for Schools. Scheme B. By T. B. Ellery, F.R.G.S. **Parts V. and VI.** We like the arrangement of these books. The exercises are fresh. They take the pupil carefully through a complete course of work.

Social Life in England. Vol. II. By John Finnemore. This historical reader will prove a powerful auxiliary to the history lesson proper. It is only by understanding the manners and customs of the people that we can appreciate the full import of various historical events. The facts related in the text are supported and illustrated by reproductions of contemporary prints.

A Biographical History Reader. Those who are acquainted with the popular "History in Biography" series of books will appreciate this Biographical History Reader, which is a selection of lives from the greater work, and arranged for use in the primary schools. The favourites only are dealt with, and the book encompasses some three hundred pages of text and illustrations. The part of the book which will not be the least valuable is the fifty pages of Summary. Here is a compendium of British History in "Date" form. The dates are full enough for a student of advanced progress.

Old Testament History. Part III. From the death of Jehoshaphat. By Rev. L. Nicklin, M.A. A text-book intended for use in the sixth form, and based on the results of recent scholarship. The writer has "throughout laid stress on examples of political cause and effect, on the religious signi fication of popular movements and of individual teaching." The political positions of the kingdoms of Israel and Judah, and their relations with their neighbours, are well brought out. Long extracts from the prophetic writings are included in the book, and the intimate connection of the prophets with the religious and political life of the Jews is very clearly shown; but it is questionable whether any sense of the continuous development of the religion of the Israelites could be gained from the book. Religious changes are indicated, but they are seldom adequately explained. Both the arrangement of matter and the style leave much to be desired. The absence of an index also impairs the usefulness of the book. These faults are partly compensated for by the excellent Table of Dates, giving in five parallel columns the Kings of Judah and Israel, the most important contemporary foreign events, and the dates when the prophets lived, and when the various parts of the Old Testament were reduced to writing. The twenty-two illustrations are interesting, but have only slight reference to the text, and two of the three maps lack detail.

BLACKIE AND SON, OLD BAILEY, LONDON, E.C.

Freearm and Industrial Drawing. By J. W. T. Vinall. This great work consists of two parts. The letterpress portion deals with the principles underlying the various kinds of drawing now usually practised in schools—freearm, freehand, brush-drawing, &c. The advice given is thoroughly sound, and practical. The letterpress also gives full directions for working out the exercises given in the plates. Teachers should really make a point of studying this portion carefully, otherwise they miss the most valuable part of the publication. The plates literally teem with examples and suggestions of what to draw.

from the simplest forms to advanced exercises. We have only one criticism to make. It would probably have been better if the plates had been arranged in proper sequence—the work of the infants on the first few, juniors on the next, and so on.

English School Texts. Edited by W. H. D. Rouse, Litt. D. The editions before us are: "Robinson Crusoe" (Defoe), "Battles of the Peninsular War" (Napier), and "The World Encompassed" (Drake). All are abridged, but the continuity of the original works is not affected. The books form part of a series which must grow popular as they become known.

Selections from Spenser. A modernised edition of pieces for reading and recitation, chosen from "The Faerie Queene," "The Hymne of Heavenly Beautie," and "The Shepheard's Calendar."

Tennyson's "Princess," with Introduction and Notes. By Ethel Fry, M.A. (London). As readers of Tennyson know, his "Princess" was a contribution to the discussion of the day—the sphere of woman in society. In her introduction, Miss Fry gives a brief statement of the gradual improvement in the position of women, and of the agitation which existed when Tennyson published the "Princess" in 1847. The poet brought to bear on the problem, she says, "his great erudition, sympathetic insight, and artistic feeling. His reverent attitude towards women, shown in this and many of his poems, rendered him peculiarly fitted to handle it, and the manner in which he has done so should earn for him woman's lasting gratitude." This edition is provided with ample notes, and with an appendix showing the additions, omissions, and changes in the text from time to time.

The Geography of British South Africa. By G. T. Warner, M.A. This is a thoughtful little volume that will be read with interest by all who desire a thoroughly impartial account of the colony, its history, resources, and the numerous problems that still await solution. There is a wealth of information that quite puts in the shade many other more pretentious works.

Erasmus' Praise of Folly. One of the series of English School Texts, edited by W. H. D. Rouse, Litt.D. We have already favourably noticed some of this excellent series. They enable us to procure very cheaply some of the old English classics which have been difficult to get; it is so much better to get one's ideas of the old authors at first-hand instead of merely reading about them in some text-book on literature. Wherever that subject is studied we would advise that this series be added to the school library.

A Note-Book on French Literature. By Philip C. Yorke, M.A. Oxon., Licencée-ès-lettres, University of Paris. Vol. ii. "Nineteenth Century." The English student of French literature cannot complain nowadays of a lack of manuals to guide him in his study. Mr. Yorke's "Note-book," which runs into about five hundred pages, is an important and welcome addition to the list of works dealing with a period of French literature of absorbing interest. The rise of Romanticism and the changes the new movement brought about in literary expression, both in prose and verse, introduce us to the chief writers of this school, from whose works abundant and interesting extracts are given. The development of realism in literature represented to a large extent only a return to earlier tendencies, but the movement gathered force from the revolt against the excesses of the Romanticists from the changing political and social conditions of the century, and from the application of scientific methods to researches into many moral problems of absorbing interest. The school of the *Décadents*, whose founder was Baudelaire, comes under review as a curious outgrowth of naturalism having little effect on the great literary tendencies of the time. The psychological and problem novel represent later developments of the younger school of French novelists. In addition to the novelists, the poets, dramatists, critics and historians of the century which has just expired receive ample notice and illustration in Mr. Yorke's book, which we heartily recommend to the notice of all who take an interest in the literature of a nation which has influenced and is still deeply influencing the literature of other cultured nations.

Little French Classics. *Oriental Scenes.* Edited by H. B. Horton, B.A. These are extracts from Gérard de Nerval's *Voyage en Orient.* Some of the most interesting passages have been chosen, and there is an introduction giving a short biography of the author.

La Révolution en Angleterre. Edited by W. G. Hartog, B.A. This little book contains two chapters from Guizot's work. *Jeanne D'Arc*, edited by A. J. Perman, M.A. There is an introduction giving notes on the life of Michelet and a brief summary of the chapters in this book. These have been happily selected, and will be read with interest.

Récits de Guerre. Edited by W. Osborne Brigstocke. Two stories taken from Paul Bourget's *Monique.*

La Mule du Pape, &c. Two charming little stories from Daudet's *Lettres de Mon. Moulin.*

La Derniere Classe, and

La Pierre de Touche. A play by Augier, which will form excellent reading for the upper forms. This, with the two above, are most ably edited by H. W. Preston, M.A.

Songs, with Music. Selected and edited by Louis A. Barté. A collection of twenty-three songs, including some action songs and popular ones such as *La Marseillaise* and *La Chanson de Malbrough.*

Jacques l'Aveugle and *L'Enlèvement de la Redoute.* Edited by W. O. Brigstocke. Two stories of quite different character, chosen by the editor as "material for a study in contrasts."

Little German Classics. *Die Geschwister.* A one act play by Goethe. Edited by Ludwig Hirsch, Ph.D.

Die Silberdistel. Edited by A. Meyer. A short story from a larger work by Ernst Muellenbach, is "for the first time presented to English readers," and it will be read with much pleasure.

All these little classics have useful notes at the end.

Plutarch's Life of Alexander (English School Texts).—The text is from the translation by North, made famous as being the source from which Shakespeare drew the material for his great classical plays: one wonders that this theme did not tempt the great dramatist. Of the interest of the book the subject is sufficient guarantee; the style is the masterly and fresh style of the Elizabethans, suffering somewhat from the over-lengthy sentence which our forefathers adopted from the classic authors.

Macaulay's First Chapter (English School Texts).—In a collection of classics, such as the "School Texts," Macaulay must of necessity be represented, and this little book gives a very characteristic piece of Macaulay's prose. With its short sentences, strongly marked emphasis, and well-balanced antithesis it will appeal to young students whose taste is still being formed. Macaulay's faults are sufficiently obvious too; a sameness in the modelling of sentences—we note in one half-page four sentences beginning "Their," immediately followed by six whose first word is "They." His conjunctions are rare, and hence there is little logical continuity. But his style is strong and clear, and his history fascinating.

Macaulay's Second Chapter (English School Texts).—The First Chapter, issued in the same series, has already been reviewed. This chapter deals with the reign of Charles II. Macaulay cannot stand as the type of the impartial searcher after truth that the great historian must be, but he certainly presents his pen-pictures with wonderful vividness and effect.

Shakespeare's Henry VIII. (The Picture Shakespeare).—The present series is intended for school use rather than for more advanced students, and it is excellent for this end. The illustrations are very good, and numerous, too; the frontispiece is quite a work of art; the numerous notes all aim at elucidation of the meaning, and are simple and clear. There is an appendix treating of the history and the disputed authorship, and also a critical appreciation.

George Borrow's Antonio and Benedict Mol: also the same author's **Gipsy Stories** (English School Texts).—These two books contain selections from Borrow's *Bible in Spain.* They are full of adventure and descriptions of the quaintest characters; surely in modern times few men of peace have lived so adventurous a life as the author, and the fact that the stories are true gives them much additional interest. The English is very fresh and original, but there is a very large admixture of words and phrases of many languages, for the understanding of which the appendices are quite insufficient.

Xenophon: Anabasis III. (Illustrated Greek Series). A. C. Liddell, M.A. The excellence of the earlier books of the illustrated series has been well maintained: if any book needed for class study is included in the series, we need never hesitate to adopt it. After accuracy of text, the help afforded by good notes is of first importance; many editions have both, but this has other excellences of its own. One of these is the inclusion of exercises for re-translation, based on the text and following the order of the chapters. The illustrations are all derived from ancient art, and the source of each is given. There is also an excellent map.

Boccaccio: Tales from the Decameron (English School Texts).—A charming selection of the tales of this famous work, suitable for school use. A book like the *Decameron*, which has furnished material for Chaucer, Shakespeare, and Keats, is well chosen for a series like this. The translation is an anonymous one of 1684, in a robust style, suggesting Defoe, and the tales

include "The Patient Grizelda" and "Isabella and the Pot of Basil."

Paradise Lost, Book VI. (Blackie's Junior School Milton).—The book is very carefully annotated, and for Junior School use the notes of necessity are numerous, for the *Paradise Lost* is difficult for young students to understand, still more difficult to admire. The introduction and the appendix on Metre are certainly not for junior classes.

English Language—Notes and Home Work. A useful book for general teaching purposes, well graded and arranged, and containing plentiful exercises for practice in analysis and parsing.

Birmingham and the Midlands is the title of a little book suitable for any class, from Standard III. upwards. It is of special interest to children of the Midlands, but may be used with advantage in any part of the country. It deals with geographical and historical matter very well.

Hawthorne's Tanglewood Tales. Classical stories too often have a forbidding aspect, but, as told by Hawthorne, there is a freshness and, we might almost say, a quiet humour about them that make them really attractive reading for young people.

German Exercises. By H. G. Atkins. These exercises have been written for use with the Skeleton German Grammar, and we can strongly recommend them for use. Right from the first, they consist of continuous prose, which is, however, in simple, carefully graduated sentences. The subjects chosen are mainly geographical and historical, and each exercise includes translation and re-translation.

Lectures Françaises. By W. Mansfield Poole and Michel Becker. This is a reader based on geographical and historical subjects, and is open to the same objections as most geographical and historical readers, viz., that the attention which must necessarily be given to the subject matter, especially as a great deal of ground is covered, interferes greatly with its use as a reader. The book is, however, well got up and beautifully illustrated.

Choix de Lectures Françaises. By Richard Kaiser. A good selection of extracts in prose and verse, many of which are old friends, but some we meet for the first time in school-book collections. The notes are limited to a few words in French at the foot of the page, and there is a table of irregular verbs and a vocabulary.

Tales by Hans Christian Andersen. The stories of H. C. Andersen have a world-wide currency, and many of the scholars who take up this book will have read the stories in English. But the book is none the less valuable on that account, for if the subject-matter is simple and well known, the story affords the better material for retranslation and conversation, and this is one object the editor seems to have had in view in selecting the tales. There are some useful notes, a few exercises for translation, and a good vocabulary. It forms a capital German reader.

Model Readers. Books I. and II. Pleasantly written stories for Standards I. and II., well illustrated by coloured and black and white pictures, and bound in a substantial and an attractive way. The notes to the teacher on reading aloud, illustrated by phonetics, will be useful at once to the inexperienced as well as to the "Old Guard." The paper is slightly toned and unglazed, and the type particularly clear.

Lancashire. A supplementary reader for Standard III.

BLACKWOOD AND SONS, EDINBURGH AND LONDON.

The World's Childhood. Part I. By M. B. Synge. An ideal book for either a boy or a girl. The old-time fairy stories are re-told in a simple and charming way. The book is fully and judiciously illustrated by black and white sketches.

The World's Childhood. Part II. M. B. Synge. This little book is a collection of stories of the Greek gods and heroes, adapted for the reading of little people of seven or eight. These tales are told in such a charming way that they are sure to delight the teacher as well as the pupils, and the numerous illustrations are quite in keeping. The words of more than one syllable are divided into syllables, not a bad plan at all, though we cannot approve of such dissyllables as "play-ed" and "seem-ed." The book would make a nice reading-book in schools of every description.

The Story of the World. This is an excellent reader, and the subjects are well chosen. Modern general history is not so well known as it should be, considering its importance. The statement that the Emperor of Japan "and his Prime Minister, Count Ito, raised Japan from a state of oriental despotism *to a first-class European power*," is faulty both in expression and in matter of fact, but it is the only sentence with which we can find fault in this well-written book.

Stormonth's Etymological English Dictionary. Edited by William Bayne. This edition has been carefully revised throughout. The words are placed either in groups or single entries, and are printed in bold black letters. The words grouped are (1) natural derivatives from the key-word of the group; (2) intimate connections of the key-word either in etymology or signification; (3) frequently a few words are grouped together as a mere matter of convenient arrangement. This system presents at once to the eye all the derived and related words, and phrases in good use. Much attention has been bestowed on the etymology, and, in words of Teutonic origin, there has been added to the Anglo-Saxon root-words various corporate words. Another point to be noted is the invariable marking of the quantities in the root-words. The editor states that most laborious care has been exercised to render the work accurate as a book of reference for the terms in use in every department of English speech. The several appendices are valuable, and the whole book is one which we can cordially recommend.

Byron—Selected Poetry. Edited by J. Wight Duff, M.A. This is a capital selection of typical pieces from Byron's poems, admirably adapted for use in pupil-teacher schools, and in the upper forms of other secondary schools. By the use of a book such as this the student will be led to appreciate that beauty of thought and perfection of rhythmic form of which Byron was such a great master. The editor has given some apposite notes on the poems he has so carefully selected.

THE CAMBRIDGE UNIVERSITY PRESS.

The Religion of Israel. A Historical Sketch. By R. L. Ottley, Canon of Christ Church and Hon. Fellow of Pembroke College, Oxford. This sketch of the development of the religion of the Hebrews forms an interesting and a useful text-book for students. It is intended as a supplement to the "Short History of the Hebrews" published by the same author in 1901, and therefore presupposes in the reader some slight knowledge of Old Testament History and of the results of Biblical Criticism. In an able and lucid manner the author deals with the development of the religion of Israel from the earliest times, when it differed little from that of other Semitic peoples, to "the consummation in Jesus Christ." Throughout, "the elements in the religion of the Hebrews, which are specially consistent with its claim to be a religion of revelation," and the fact that the history of the Hebrews was a progressive preparation for the Gospel, are earnestly insisted on. The book gives an impression of fair-mindedness and moderation. In so short a work there is of course no place for the discussion of controversial questions, and no attempt is made to point out the relative value of evidence. There is a full general index, a useful glossary of Hebrew and Semitic words which occur in the text, and a list of chief works consulted.

Cambridge Bible for Schools and Colleges. Corinthians II. Edited by A. Plummer, M.A., D.D. The epistle is treated in that full and thorough manner which has established a reputation for the other volumes of the series, and even the most advanced college student will find ample guidance in this book. The erudite introduction closes with a bibliography of commentaries on the Epistle, with all of which the editor is evidently familiar.

St. Mark, and St. John. The Revised Version, edited with introduction and notes for the use of schools. These handy little volumes are admirably adapted for ordinary school use. The notes are to the point, and the scholar who carefully studies them and the introduction in their proper connection with the text will acquire a sound knowledge of these two Gospels.

Voyage en Italie. By Théophile Gautier, with introduction and notes by De V. Payen-Payne. This charming book comes as a change to the sort of book usually taken for study in class. Needless to say, it is a model of prose style, and the description of Venice will be enjoyed by all those who have not had the privilege of seeing the city, and still more by those who have. The text is fairly simple, so the editor is able to devote a great deal of attention to the subject-matter, and he gives some excellent notes on the places mentioned, and frequently illustrates them by sketches and plans.

CASSELL AND CO., LA BELLE SAUVAGE, LUDGATE HILL, LONDON.

Work: the Illustrated Weekly Journal of Handicrafts. This half-yearly volume contains Nos. 803 to 828. It is a most

valuable compendium of information to the man who works with brain and hand together. It answers almost any question beginning with, "How do you make —— ?" Some of the articles are, inevitably, highly technical; but even the ordinary amateur will find something to help him in his hobbies. Judging by the "Questions and Answers," there must be an astonishing number of people who are thirsting for information.

Cookery Recipes for School and Home. By Lizzie Heritage. About forty pages of useful recipes such as could be worked out by pupils in elementary schools are given in this little book, together with simple instructions on the care of everything connected with the kitchen. There is a set of Test Questions at the end. It is a book that, having seen it, most "little cooks" would like to provide themselves with.

Union Jack Series. Book IV. This book is up to the same high standard as its predecessors in the series. The material includes some standard pieces which have done duty in earlier readers, together with pieces that have a delightful freshness about them. It is well illustrated and neatly bound.

The Swiss Family Robinson. This story is transcribed "in words of one syllable," although one can detect a few exceptions. It is questionable whether children should attempt to become familiar with all the monosyllables before easy words of two or more syllables. One would expect the style to be strained, but it is not so. Children generally like this story at first.

The Citizen Reader. This new edition of a school book which has sold in thousands has brought matter quite up to date. The chapters are all interesting, and deal with the duties owed by British citizens to their country, their countrymen, and to themselves—duties which every schoolboy and schoolgirl ought to know.

W. AND R. CHAMBERS, LIMITED, EDINBURGH AND LONDON.

From Fancy's Realm. By Mrs. A. Baldwin. Two unreal stories, but interesting to little children; full of fancy, but at the same time containing matter which will be helpful to a growing mind. The stories are an improvement on some of the fairy tales which are to-day finding a place in our school reading books.

Twentieth Century Geography Readers. Book IV.*a*. The British Isles. This is an eminently useful book, both as a reader and as a geographical text-book. The matter consists of an up-to-date geography of the British Isles, written in a clear and interesting style. It is well illustrated, clearly printed, and strongly bound.

Twentieth Century Geography Manuals. The British Isles. A capital little book, with many interesting illustrations, such as "The Potter at Work" and "Hop-picking," and very good coloured maps. This handbook gives a summary of the matter in the Reader.

First Book of Stories from British History. Second Book of Stories from British History. The *Advanced History of England* in this series has already received favourable notice here. These two books, for Standards I. and II. respectively, are equally good. Each book contains selected stories covering the whole of English history, and Book I. contains interesting chapters on the home life of the people. The stories have been selected with care, and are well written. The illustrations, some of which are coloured, will, with a few exceptions, really help the young ones to appreciate what they are reading.

CHAPMAN AND HALL.

Figure Composition. R. G. Hatton. A capital book on a very important subject in art. Mr. Hatton deals with his subject thoroughly, and explains the fundamental principles which underlie the use of the figure in architectural, decorative, pictorial, and emblematic composition. He leads the student to see that what, at a casual glance, looks like an accidental arrangement, is the result of careful study, and follows well-defined laws, and that if the student is to be successful he must make himself familiar with these laws.

The book is illustrated by a large number of original drawings, as well as reproductions of famous pictures and engravings. It is a volume which every art student and teacher should make a point of getting. Through it they will most certainly add very considerably to their knowledge of the subject.

THE CLARENDON PRESS.

Les Normands en Angleterre. By Augustin Thierry. This will form a very suitable French reader for the middle and upper forms, and it is also a good thing to read English history written by a foreigner, but Aug. Thierry tries to explain all historical facts as arising from the co-existence of two distinct races in this island; a theory which is far from sufficient in many cases. The present volume, however, contains only the second and third books of the *Histoire*, and in these the defects of the theory are not very conspicuous. As the book is intended as a French reading-book, the Latin citations from authorities are omitted, and their place taken by some useful notes dealing with technical terms, and with persons and places mentioned in the text. The book is carefully edited, well printed and bound.

Le Serment. By Jules David. This is an interesting story told in a vivid manner. It is elucidated by useful notes, and is very suitable for use as a text-book in a secondary or higher grade elementary school in which French is taken.

Voyage en Espagne. By Théophile Gautier. Edited by Gerald Goodbridge, B.A. This book is rather too advanced for the great majority of pupils even in the best secondary schools, but for those who have made good progress in the language it will afford excellent practice, and greatly increase their vocabulary. It gives a delightful account of the manners and characteristics of the Spaniards. The numerous Spanish words and phrases met with in the book are explained in the notes, which deal at sufficient length with other difficulties. The introduction gives an interesting biography of the author, but as the book is not intended for beginners there is no vocabulary.

Xenophon's Anabasis. Books I., III., and IV., edited by J. Marshall, M.A., and **Book II.**, edited by C. S. Jerram, M.A. Xenophon is generally regarded as the most suitable author for the beginner in Greek, and hence the notes in this edition are such as the junior pupil requires, clear and explanatory of the text rather than critical. Each volume opens with an introduction dealing with the scope of the book, and the first contains, in addition, a short but scholarly account of Xenophon as a writer. The vocabulary at the end of each book is a full one to the whole of the Anabasis. We heartily welcome this issue of the favourite Greek prose classic.

Une Haine à Bord. By De la Landelle. Edited by R. E. A. Chessex, B.A., Instructor in French in H.M.S. Britannia. (Oxford Modern French Series, edited by Leon Delbos, M.A.) This is an excellent selection for the series in which it appears, and will be specially valuable for naval cadets, dealing as it does with life in the French Navy, and involving the use of quite a large nautical vocabulary. The story will interest, and the acquisition of useful idioms and terms will follow. The notes will be of much use to non-nautical teachers.

Une Ténébreuse Affaire. By Honoré de Balzac. Edited by Marie A. Péchinet, B.A., Senior Staff Lecturer in French in the Royal Holloway College.

Voyage aux Pyrénées. By H. Taine. Edited by William Robertson, sometime Examiner in Modern Languages in the University of Aberdeen. These two volumes of the series are in no respect inferior to those which have already appeared. The works selected are interesting in themselves, and are likely to create in the pupil a desire to read more. The annotations are good, and the binding and print are excellent.

JAMES CLARK AND CO., 14 FLEET STREET, LONDON, E.C.

Outline Text Lessons for Junior Classes. By Gladys Davidson, author of "Kindergarten Bible Stories," &c. First Series. This little book contains ten lessons based on flowers and sixteen on pictures, the aim being in each case to enforce some religious or moral truth. For the most part the treatment is simple and appropriate, but the ideas are not always so easy of grasp by the young as the words are apt to suggest. The untrained Sunday-school teacher will find the book helpful and suggestive.

W. B. CLIVE (UNIVERSITY TUTORIAL PRESS, LTD.), 157 DRURY LANE, LONDON, W.C.

We are pleased to notice that some of the well-known University tutorial text-books have been specially edited for the use of Certificate and Scholarship students, viz., Deakin's **Euclid,** Certificate edition; Deakin's **Algebra,** Scholarship edition; **Certificate Algebra** by Bryan and Deakin, and Perret's **French Reader,** Certificate edition. The mathematical books are universally admired for their excellence, and

candidates for the different examinations will be much helped by the special questions given at the end of the book. Now that set authors are no longer given in the Certificate and Scholarship French papers, all candidates must go through a selection of passages such as the excellent collection before us.

Scholarship Mathematics for Women. This little book contains just the matter required by women who take mathematics instead of a language. The work is clearly set out.

Scholarship Elementary Science, Chemistry, Section II. By H. W. Bausor, M.A. (Cantab.). This little book on chemistry, as its title indicates, has been specially written to help candidates for King's Scholarship Examination, and assumes a knowledge of the information contained in Section I. of the same series. It contains chapters on the Law of Combination by Weight and Volume and on Charles' Law and Boyle's Law. These are followed up by sections on the Atomic Theory and Avogadro's Hypothesis, and the connection between these is elucidated by the help of suitable historical notes.

The section on Systematic Chemistry is not quite so good as the earlier portion of the book, but it gives just about the information necessary for the student for whom it is intended. The diagrams are good, and the book will doubtless be used largely by scholarship candidates.

Stanley's Life of Arnold. (Chapters III. and IV.) These chapters form part of one of the alternative special subjects for the Certificate Examination in 1906, and we should recommend all candidates to get this edition for the special preparation of the chapters set, and trust that the interest acquired will lead them to read the whole of Dean Stanley's biography.

Scholarship History of England. By C. S. Fearenside. The section of Mr. Fearenside's well-known history, which covers the special period for the King's Scholarship, is now issued separately, and its value is enhanced by appendices, one of which gives useful biographies of the notable people of the period.

School Training. By R. E. Hughes, M.A. Oxon., B.Sc. Lond., author of "Schools at Home and Abroad," &c. This little manual is written on a large scale of thought; it considers the aim of School Training, physical, intellectual, and moral, and the relation of the school to the home and to the community, but as the available space for these discussions is limited to 110 pages, the necessary result is a treatment which must be described as wanting in thoroughness, and which occasionally becomes decidedly superficial. This is to be regretted, as the subjects have been so well treated elsewhere by the same writer. Doubtless it is more difficult to write a little book than a big one on such a subject. At the same time there is a very refreshing width of view on most questions, and a useful detachment from the merely professional attitude.

The Educational Ideas of Froebel. By Jessie White, D.Sc. Lond., late Vice-President of the Home and Colonial School Society's Kindergarten Training College. This little manual has been prepared with the primary aim of meeting the requirements of the Certificate Examination of 1906. The exposition follows the biographical method, and traces the growth of Froebel's ideas from stage to stage of his busy life. This is probably the best line of treatment for those who are making their first acquaintance with Froebel, and the result is a very useful little manual, not only for examination purposes but for general reading by young teachers.

School and Home Hygiene. Lyster. 220 pp. Hygiene as an examination subject bids fair to rival the evil reputation so long held by Physiography in being a scientific hotch-potch. It comprises a little anatomy, a little physiology, a little chemistry, a smattering of physics, just a suspicion of meteorology, arithmetic to taste, a little ambulance work, and some domestic medicine. Elementary text-books attempting to deal with such a scrappy subject are apt to reflect the nature of that subject, and the present volume is no exception to the rule. The bold claim established in the preface as to logical sequence and treatment is not sustained; surely the discussion of dislocations should follow that of joints, and the question of fractures and repair of bone should not be separated from that of bone position and structure. In many respects the book is already antiquated. The treatment of cow's milk given on p. 98 is simply indefensible; the scum on boiled milk is not coagulated albumen, as p. 93 seems to imply; the solvent action of soap is not explained, a case of "Look the difficulty boldly in the face and—pass on." The Sylvester method of artificial respiration has for some time been shown to be almost the least effective of all, and should be everywhere discouraged in favour of the "prone-pressure" system. The example of Sunderland ought to be sufficient warning against associating goitre with the presence of magnesium salts in water. Surely it is an oversight to say (p. 60) that in the aspiration method there is no control over the incoming air! No distinction is made between wasteful and economical methods of frying (p. 103), although the former is peculiarly British. Under the head of coffee (p. 109), a word in season might have been given about the numerous "coffee essences" thrust upon the market. In Fig. 61, p. 80, the title should add the words "turned up," and the name of a well-known filter is Berkefeld (p. 176).

Tutorial Chemistry. Vol. I., Non-Metals; Vol. II., Metals. Second Edition. By G. H. Bailey, D.Sc. (Lond.), Ph.D. (Heidelberg). In the second edition this admirable book on chemistry has been brought up to date. A very useful introductory course has been inserted, and the practical side of the book has been to some extent extended.

The diagrammatical method used on pp. 90–92 for representing the constitutions of gases will be found useful by the student, and can be readily applied in other cases. One page only has been devoted to argon, helium, neon, krypton, and xenon. In view of their comparatively recent discovery, and the great interest attached to them, a more detailed account would have been welcome to the average student. A short account of radium and polonium has been inserted at the end of vol. ii. The historical notes are an interesting feature of the book, and will be especially appreciated by students preparing for the London University examinations.

There are still a few printers' errors; for example, on p. 82, vol. ii., we find $CaSo_4$ for $CaSO_4$, and Ca for CaO. On the whole, however, the book is one which can be well recommended.

The New Matriculation Chemistry. By G. H. Bailey, D.Sc., Ph.D. This book is the third impression of the second edition of this useful book. As a text-book for the Matriculation Examination of the London University this book is most suitable, as it covers the syllabus without going too far beyond it. As a text-book for other students it is suitable for those studying the non-metals, but being written specially for matriculation students it does not attempt to deal seriously with the chemistry of the metals. These will be found described in the author's larger text-book, "The Tutorial Chemistry."

The Scholarship History of England to 1603. Mabel E. Carter. We have here a short accurate history, well suited for the use of those preparing for the King's Scholarship examination. Personally we think that for a book of this class the genealogical tables are unnecessarily full; and, certainly, the maps, though containing all needful information, lack clearness. But otherwise the book is excellent. It contains only two hundred pages, but, thanks to good writing and clear insight, within that small compass is found much matter both for memory and reflection.

DEAN AND SON.

The Children's Picture Music Book. H. Stafford Moass. The illustrations in this book are capitally done, and will undoubtedly serve to impress the names of the notes on a young child's mind, but we doubt the wisdom of beginning music at the tender age that would require such assistance.

The Age of Fable. The Age of Chivalry. Legends of Charlemagne. By Thomas Bulfinch. These are three capital volumes, in which an attempt is made to supply the modern reader with such a knowledge of the fables and legends of classical and mediæval literature as will enable him to understand and appreciate the allusions which so frequently occur in modern literature. The stories are told in a bright and telling manner, and now that less time is devoted to the study of the classics these volumes will be found instructive as well as interesting.

J. M. DENT & CO., BEDFORD STREET, LONDON, W.C.

Dent's New First French Book. This is a new edition of a book which has quickly secured a wide use in our schools. We are convinced that the direct method is the most effective in teaching a foreign language, and this book is a most able guide to that method.

The Traveller and **The Deserted Village.** A neat little book, with text and clearly expressed notes.

Tennyson's Princess. Edited by A. J. Grieve, M.A. This beautiful poem is perhaps, as regards its theme, hardly the most suitable for school use, for it treats in its fanciful way of the equality of the sexes and the various claims of the advocates of women's rights; but as poetry it is one of the most beautiful works of the Victorian age. The editor in his introduction gives some very good guidance to an appreciation of Tennyson's style, and the notes are just what one wants—full, but not wordy.

Samson Agonistes (Milton). Edited by A. J. Grieve, M.A. This poem would form a noble subject of study to an advanced class, as an alternative to the *Paradise Lost*. The introductory notes on the versification will prove useful to the teacher, and the notes are very numerous—a very necessary thing in the editing of a poet so full of classic feeling as Milton is. The very numerous references to parallel passages show the fitness of the editor for his task.

Virgil's Æneid II. Edited by R. J. Hughes, M.A. This edition is without illustrations, and it suffers accordingly by comparison. The paper and binding do not seem adapted to the peculiarities of the schoolboy's nature. The notes are especially directed to assistance in translation and to explanation of the theme; the grammatical notes are few. The modern theory is for more reading and speaking and less grammar, but this can easily be carried to excess. Without a sound grammatical basis the student is always at a loss with every difficulty, and can never write idiomatic Latin.

Practical Nature Study for Schools. By Oswald Latter, M.A. An excellent method of teaching Nature Study, and one which is calculated to awaken the child's interest and powers of observation. Though intended primarily for children, many of the courses might be advantageously worked through by students of maturer age. The care exercised in the selection and sequence of the questions, precludes any possibility of answers other than those resulting from actual personal observation, which, after all, is the mainspring of Nature Study. The author's statement that the treatment afforded to the subjects is not exhaustive, is certainly true with regard to the short chapter on birds.

Gray's Elegy. This is a poem which, owing to its purity of form and elegance of diction, readily finds a place in the school recitation list, and this edition will be found of service to teachers who are looking out for a cheap and reliable copy.

GINN AND CO., ST. MARTINS' STREET, LEICESTER SQUARE, LONDON.

Goethe's Hermann und Dorothea. Edited by P. S. Allen. This poem has aptly been styled "the veritable epic of modern Germany," and it is a literary jewel of which Germany may well be proud. The work is a fine proof of Goethe's poetic powers, and teachers of German are under a debt of gratitude to Prof. Allen for the careful and efficient way he has prepared it for school use.

Die Journalisten. By Gustav Freytag. Edited by Leigh R. Gregor. Although this comedy is specially fitted for the stage, as being the work of a master playwright, it is by no means unsuited for class-room study, and the upper forms will greatly enjoy reading it with Mr. Gregor's explanatory notes, and the exercises based on the text will do much to strengthen their hold on the language.

Pascual López. By Doña E. P. Bazán. Considering the ease with which Spanish can be acquired by one who has got hold of French, and its usefulness in commerce, it is surprising that so few Englishmen make a study of it. Our American cousins are taking the matter in hand, and several Spanish books have been edited for the use of schools and private students. A week or two at Spanish grammar will enable the beginner to read such a book as the present, and to enjoy it. The notes explain the few phrases that might be called difficult, and the vocabulary not only seems to be complete, as far as we have tested it, but the explanations are backed in many cases by the derivation. We recommend our readers to try to get through this interesting book.

Selected Poems. By Elizabeth Barrett Browning. Some of Mrs. Browning's poems have found their way into the schoolroom, but this seems to be the first regular attempt to popularise, for educational use, the poems of the lady who "made of her verse a golden ring between Italy and England." We feel that our modern poets are neglected by the ordinary student, and welcome the appearance of this carefully edited collection of verses.

La Mère de la Marquise and **La Fille du Chanoine.** By Edmond About. These two novels are extremely well suited by their style and subject-matter, as well as by their length, for study in class. The present edition is admirable; it has brief notes, a vocabulary, and some useful imitative exercises.

Der Zerbrochene Krug. By Heinrich Zschokke. This charming little sketch or idyll can be recommended as highly suitable for use in German classes. The text is well printed, and the notes and vocabulary make this edition a most useful one for beginners.

In St. Jürgen. By T. Storm. A touching little story of the influence of circumstances on the course of true love. This is very well edited, with notes, vocabulary, and some useful exercises in retranslation.

Practical German Conversation. By Laurence Fossler. This is a capital book for the more advanced student, and the great body of students who "can write German but cannot speak it" will find in it a systematic guide. We should like to see a more elementary book on the same lines.

Elements of Botany. Bergen. This is a revised edition of Bergen's Botany, first issued in 1896 for the use of higher-grade schools in the United States. Advantage has been taken of the revision to bring the work thoroughly up to date, both in form and matter. A great deal of unnecessary histology has been cut out, and the space thus gained has been devoted with considerable success to the systematic treatment of plant types. In this connection a welcome departure from commonplace British methods is the full and fair treatment of the flowerless plants. A useful illustrated appendix serves at once as glossary and reference table. On the mechanical side the book maintains the usual high standard of American publications, a noteworthy feature being the presence of fifteen photo-plates in addition to nearly 200 illustrations in the text.

Selections from Standard French Authors. By O. G. Guerlac, Assistant Professor of French in Cornell University. This book is intended to cultivate the reader's taste for what is really good in French literature, and combat the practice of selecting texts for the beginner's perusal merely because they are modern and entertaining. As the editor justly remarks, these are often short stories written by unknown authors for a special French public, and full of slang phrases and ephemeral allusions. For our own part we should not allow our young pupils to read anything at first but the works of acknowledged masters of French prose and verse, and should endeavour to form their taste and style on them. Extracts are given from Molière, Bossuet, and other great writers of the seventeenth century up to André Theuriet in prose and Sully Prudhomme in verse. The extracts are very well chosen and annotated, and the vocabulary appears to be quite sufficient. In *Le Capitaine du Normandy*, by Victor Hugo, the author mentions that the British Fleet was riding at anchor in Sheerness Roads, near to Southampton. Hugo no doubt meant Spithead, and it is probably owing to the fact of the editor being an American that this slip of the great French writer has not been noticed.

HACHETTE AND COMPANY, KING WILLIAM STREET, STRAND, LONDON.

English Colloquialisms with their French Equivalents. By Arthur H. Smith, M.A., L. ès L. This is a handy little collection of useful every-day expressions, including some rather familiar ones. In his preface the author says, "They have for the most part been used in conversing with my classes," and for such a purpose they seem very suitable.

GEORGE G. HARRAP, YORK STREET, COVENT GARDEN, W.C.

Contes et Legendes. 2me Partie. By H. A. Guerber. Having used the first part in one of our French classes we heartily welcome the appearance of Part II., and the stories in this collection seem even more interesting than those in the previous one.

D. C. HEATH AND COMPANY, LONDON.

Zadig and Other Stories. By Voltaire. Edited, with notes and a vocabulary, by Irving Babbitt, Assistant Professor of French, Harvard University. The author has made a very good selection of Voltaire's stories, some of which contain oblique allusions to personages of the poet's own time, and incidents of his life. The notes and vocabulary are good, and the book is preceded by a very compact and well-written account of Voltaire's position with regard to the philosophical movement of his time, and of his chief claims to literary distinction. The book is excellently got up.

WILLIAM HEINEMANN, BEDFORD STREET, LONDON, W.C.

The Poems of Lord Tennyson, with Introductions by Arthur Waugh. Any attempt to popularise the works of one

of the best—if not *the* best—of our Victorian poets deserves success; and we are glad to welcome these dainty little books in Mr. Heinemann's "Favourite Classics" series. We have received *Idylls of the King* (2 vols.); *In Memoriam*; *Maud*; and *English Idyls*. The books, which are of a handy size for the pocket, are well printed and neatly got up.

HODDER AND STOUGHTON, PATERNOSTER ROW, LONDON, E.C.

Modern Electricity: a Practical Working Encyclopædia and Manual of Theories, Principles, and Applications. By James Henry, M.E., Professor of Electrical Engineering; and Karel J. Hora, M.Sc., Expert Electrical Engineer. With one hundred and fifty illustrations. This book is eminently one for the practical electrician. Theory is subordinated, definitions are concise, descriptions are aided by illustration, and working laws are very fully illustrated by examples and problems. Questions, with answers, will help in self-examination. The book is one of a type not too common; it aims at helping those whose scientific education has not been very profound, and its style is clear and simple. At the same time one cannot excuse such a sentence as the following: "Dragging the feet quickly over a woollen carpet and then approaching a conducting body with a finger, a spark will show, which in some instances has been utilised to light the gas." We recommend the book to engineers and technical students.

The New Knowledge. By Robert Kennedy Duncan. This volume, which makes its appearance at an opportune time, has for its full title "The New Knowledge, a Popular Account of the New Physics and the New Chemistry in their Relation to the New Theory of Matter." At the outset it must be acknowledged that Professor Duncan has made a successful attempt to present in clear language the work of men who are acknowledged authorities, such as J. J. Thomson, Becquerel, M. et Mde. Curie, Rutherford, Ramsay, Crooks, Lodge, &c. It is impossible to give more than a brief outline of the contents of this admirable volume, which includes Current Conceptions on Matter, The Periodic Law, Gaseous Ions, Natural Radio-Activity, Resolution of the Atom, &c. There is a large number of readers whose technical training renders them quite unable to follow the specialised and technical works written by the discoverers themselves, and although the pseudo-science of the magazines may be within their reach, the accounts given are not always noted for accurate exposition. All such we can only advise to make themselves acquainted with this volume. The clearly written text, together with the numerous illustrations, will enable them to understand and appreciate a most interesting and fascinating subject.

T. C. AND E. C. JACK, LONDON AND EDINBURGH.

Stuart England. By Shadrach Hicks, Barrister-at-law, etc.

Hanoverian England. By A. W. Dakers, B.A., Peripatetic Teacher, Newcastle-on-Tyne. These two volumes form respectively the fourth and fifth books of the Jack Series of Historical Readers. They are written in an easy narrative style, and are calculated to give children very clear and definite ideas of the leading characteristics of each of the periods treated of. The growth of political liberty, the extension of our manufacturing system, changes in the habits and modes of thought of the nation, the development of the Empire, and the leading figures in literature, art, and science are all treated of in such a way as to interest the scholar, and to show him how the present has grown out of the past. The print and get up of the books are good.

Annals of the Cymry. By T. Stephens, B.A. This little book should find a place in every Welsh school. It traces the history of the Welsh Celts from the wanderings westward of their prehistoric forefathers to the time when the country lost its independence under Edward I. It is well calculated to fulfil the purpose for which it has been compiled, to cause the children of Wales to feel a pride in the doings of their ancestors, and to make a united endeavour, as the author puts it, to bring in the Golden Age of the Principality.

The 'Three Term' Algebra. By C. W. Crook, B.A., and W. H. Weston, B.A. **Books I. and II.** The writers of these books evidently know both what they are about and what the children need. The exercises are most carefully graded, and no point in the instruction appears to be left out. In the hands of a careful teacher, rapid progress ought to be made by even a class under normal ability. We recognise, too, in the books the hand of an expert editor.

THE LONDON AND COUNTIES PUBLISHING COMPANY, LIMITED.

Lessons in Type and Antitype; or, the Gate of Paradise. By M. Cordelia Leigh, author of "Simple Lessons from Nature," &c. The "Gate of Paradise" is the famous Ghiberti door of the Baptistery at Florence, with its relief sculptures of Old Testament scenes, and its connection with this series of lessons is simply that these also start from the Old Testament in order to illustrate the New. The lessons are carefully worked out in detail, with an embarrassing wealth of Scripture reference, and we are informed in the preface that they have all been actually given in Sunday school and Bible classes, and "seemed to attract interest and attention." In the hands of most teachers it is to be feared that such a result would not be very evident. There is, however, much useful material presented in the twenty-four chapters of the book.

LONGMANS, GREEN, AND CO., PATERNOSTER ROW, LONDON, E.C.

A neat little book in a paper cover is to hand from Messrs. Longmans, Green, & Co., which is of special interest to those who have the close management of boys and girls, and also to the boys and girls themselves. This is not always the case, for children do not, as a rule, see eye to eye with those who have either to instruct them or keep them under control. The book in question is **The Little Book of Health and Courtesy.** The writer—P. A. Barnett—starting from the fact that the real root of good manners is good feeling, shows how this good feeling may be cultivated by healthiness and cheerfulness. The paragraphs are well spaced, and the reader has no difficulty whatever in lighting his eye on: "Carefully clean the ears inside and at the back," and such like timely recommendations. The chapter of Table Manners will be applicable to older people as well as to the young; and when one reads: "If you want any particular thing that is not within your reach, see where it is on the table, and ask the person nearest to it if he will please pass it to you. Do not cry out 'Sugar, please,' to the wide world, and expect every one to look round for what you are pleased to want," one remembers how often one has put down a cup from the lips or looked over the rim of it, in disgust, at such a request by an ignoramus at meals. "Talk at meals should be about pleasant things," not murders or sore heads. Street manners and railway-carriage conduct are not forgotten by the writer, though we are afraid they often are by old and young alike, and many excellent things are in this chapter recorded. The *finale* on General Conduct is apt and to the point. If only—ah! if only we could see the "touchy people" acting on the hints here given "to be very slow to take offence," we should the more seldom have to wonder what in the world we are supposed to have done to so and so. That the brochure may find a place in the company of every man, woman, and child is our ardent and sincere desire. All will profit by its reading. Every one will "put a good face on things." Happy times!

Religious Teaching at Home. By L. H. M. Soulsby. A suggestive pamphlet, full of wise things for the earnest mother who has the religious instruction of her children at heart.

A Smaller Commercial Geography. By G. G. Chisholm, M.A., B.Sc. The precession of the equinoxes is a slow affair, and the physical changes of the earth's surface do not proceed very rapidly, so that books on astronomical and physical geography do not need much revision; but trade is subject to such rapid alterations, both in bulk and direction, that a commercial geography is nothing if not up to date. Mr. Chisholm has done wisely in giving us a new edition of his useful book. This shows most careful revision, and may be strongly recommended as a thoroughly reliable guide to this section of the study of geography.

Elementary Practical Physiology. By John Thornton, M.A. This is the first edition of a new elementary book on physiology, but judging from the character of the book it will not be the only one. Within its three hundred pages is contained much useful matter put in such a way as to be readily assimilated. Although the book is entitled "Elementary *Practical* Physiology," the subject scarcely lends itself to practical treatment for junior students, but as a general text-book of elementary physiology it should become very popular.

There are one hundred and seventy-eight illustrations, and these are far better than any that have previously appeared in any elementary physiology, many of them being borrowed from larger standard works.

A few of the diagrams are coloured, thus greatly enhancing

their clearness. The paper and print, like the general get up of the book, are excellent.

At the end of the book is a glossary of terms which will be much appreciated by both teachers and students.

British Empire Readers, Books I.–VI. This series introduces us to many writers, which, although found in the library, are almost quite new to the school-room—Conan Doyle, Mayne Reid, Rider Haggard, Stanley Weyman, Rudyard Kipling, Mark Twain, &c. With such writers as these in the more advanced Readers, it is hardly necessary to say that these books maintain the interest and attention of the children from first to last. But good as these are, the earlier books are even more delightful. There are scores of writers that will interest elder scholars, but those that write for the young and have a style that is simple and child-like, without being simply childish, are few and far between; the Readers before us, however, are treasure-houses of good things for the little ones—the wonderful fairy tales of Andersen, the humour of Uncle Remus, the delightful poetic fancies of Stevenson, and others equally charming. The paper and type are both very good, while some of the coloured illustrations are really works of art.

M'DOUGALL'S EDUCATIONAL CO., LTD., LONDON AND EDINBURGH.

M'Dougall's Firm and Flexible Point Drawing Cards. Thirty-two cards of line and brush drawings of varied examples—common objects, nature forms (animals and flowers), and letters. The teacher's cards of hints, which is enclosed in the stout case, is a useful addition. The copies of this set are about equal to the ability of a Standard III. child.

Swedish Recreative Exercises for School and Playground. By Grace A. M'Millan, L.L.A. This is a commendable attempt to provide a pleasant and interesting physical training for young children, and the author endeavours to show that the movements in the various games coincide with the requirements of the "Government Syllabus." The book is divided into three parts, the first of which—Song Games—is certainly more suitable for children in the Kindergarten or Infant stage than, as the writer claims, for children of all stages of school life. The games themselves are, in many cases, excellent, but the song-words are frequently absurd—even for infant ditties—the verses too long or too many, and the metre sometimes so erratic that the words scarcely seem to fit the music. Evidently a too-literal translation has been made from the Swedish text. Some of the Song Games too, require dance-steps—the "Polka" and Pas de quatre"—for their execution; which is surely too much to expect from infants, and the teaching of which is scarcely within the province of the class teacher. The Action Songs are very good. Parts II. and III. consist of Running and Ball-throwing Games respectively, many of which are very ingenious, but hardly necessary to British children, with their already long list of excellent outdoor and indoor games.

The diagrams are plain and instructive, and the type and music very clear.

Commercial Geography of the British Empire. The pupil has here, in a cheap form, a vast collection of facts dealing with the commerce of our empire. The information is reliable and its arrangement is clear.

MACMILLAN AND CO., LTD., ST. MARTIN'S STREET, LONDON, W.C.

Easy Graphs. By H. S. Hall, M.A. Within the small compass of some sixty pages Mr. Hall has simplified the essentials of elementary graphical work, simplified so that no student who uses the book needs to be more fully acquainted with Algebra than as far as Quadratic Equations. The last section of the book deals in a remarkably successful way with the leading principles of linear graphs as applied to problems. In a word, the author's work has been well done, that of the student will be interesting and easy.

Carrots. By Mrs. Molesworth. A favourite story bound cheaply.

The "Globe" Geography Readers. Intermediate. By Vincent T. Murché, F.R.G.S. England is dealt with in this book in an easy and interesting way. The lessons are discursive and varied in point of subject, and inasmuch as they are built up on scientific principles, they form a course of deductive reasoning which cannot fail to be impressive. The illustrations seem to us to be particularly well chosen for teaching-by-the-eye purposes.

Ballads Old and New. Parts I. and II. Nicely published books of well-selected ballads, which, although intended for use in the secondary, will be found equally acceptable in the elementary schools. The inclusion of such pieces as *The Jew of Venice, King John and the Abbot of Canterbury*, and others of a similar nature, is the result of a happy idea, while, perhaps, without the hackneyed *Casabianca* and *Lucy Gray* no books of ballads would be considered complete.

Barnaby Rudge. This is a reprint in cheap form of the first edition of Charles Dickens' story of the "No Popery" riots of 1780, with the illustrations, and an introduction by Charles Dickens the younger. The type is very clear, and the pictures are amusing in their grotesqueness. Poor Barnaby!—surely Dickens wrote this story when his mind was distressed by overwork. It is certainly in a minor key.

Macaulay's William Pitt. Edited by R. F. Winch, M.A. This work was one of the last written by Macaulay, and it is certainly one of the noblest essays he ever wrote. His prose style is here seen at its very best. Mr. Winch's notes deal almost entirely with the subject-matter. This part is very thoroughly done, so that the essay with this annotation becomes highly useful and interesting from the point of view of history and not literature only.

Paradise Lost: Book VI. Edited by H. B. Cotterill, M.A. The notes and the introduction are alike of the highest quality. Much of the latter consists of appreciations culled from the greatest English critics. The *Paradise Lost* is a difficult poem for school use, but we think the teacher will find all he wants in this edition.

Poems and Sonnets from Wordsworth, preceded by **Lowell's Essay on Wordsworth.** Edited by H. B. Cotterill. The Irish Intermediate Education Board having chosen some thirty of Wordsworth's poems, and also Lowell's Essay, Messrs. Macmillan have published these in one book. The Essay, with Mr. Cotterill's valuable footnotes, forms a most fitting and appropriate introduction. The notes are very full, and intended chiefly to point out and illustrate the beauties of the poetry.

French Commercial Practice. Part I. By James Graham and George A. S. Oliver. We can heartily recommend this book, not only to the commercial student and business man, but also to the ordinary student of French. This part deals mainly with the forms used in correspondence, and the bulk of the examples of illustrations, but not all, have a commercial bearing. To make the book more generally useful to students, there is not only a translation of the letters given, but a collection of suggestive questions and conversational exercises.

German Commercial Practice. Part I. This book is uniform with the preceding, and will meet the same need. Both books supply a great educational want.

A New Geometry for Senior Forms. By S. Barnard, M.A., and J. M. Child, B.A. (Cantab.). This is the second part of the work entitled, "A New Geometry for Schools." It is divided into two parts—practical and theoretical—the former containing definitions of the trigonometrical ratios, expressions for the areas of triangles, parallelograms, circles, etc., finding geometrically the third, fourth, and mean proportionals, and the construction of regular polygons, etc.

The sections on solid geometry comprise the subject-matter of Euclid, Book VI., the elementary geometry of the sphere, cylinder, etc., and proofs of the usual formulæ for areas and volumes of prisms, pyramids, etc.

The second part consists of geometrical theorems corresponding to certain algebraical identities, etc. This work is intended for students taking the Oxford and Cambridge Locals, and other examinations of similar and higher scope, and it is hoped that the book will be found useful by engineering and other students.

The numerous examples—taken from recent examination papers—with the answers, add greatly to the value of this scholarly treatise.

The figures having a black background and the lines and lettering being in white, are very striking and prominent. We are sure that this book will be found very useful by students taking this subject, as all the theorems and proofs are stated lucidly and succinctly.

New Globe Readers. Primers I. and II. These Primers will be welcomed by all admirers of the "Look and Say" method. From the beginning the reading is in sentences, and each sentence has an attractive picture in black and red—almost too attractive. The word-building at the top of each page aims at overcoming all difficulties found beneath. The Second Primer carries out the same idea, and each lesson contains a separate little story.

Kenilworth. By Sir Walter Scott. Edited by Andrew Lang. This favourite work has been added to the "Prize Library." It is tastefully got up, and contains twelve good illustrations and an introductory essay in which the editor discusses the historical evidence bearing on the question of how

Amy Robsart really came by her death, and other points connected with the novel.

Tom Brown's School-Days. By Thomas Hughes. A reprint of this standard book now appears in the *Illustrated Pocket Classics for the Young*, and to no book is the general title more applicable. Its blue and gold binding, and the numerous splendid drawings with which it is illustrated, all combine to make it a book that a boy will read and treasure.

Modern Commercial Practice, with Correspondence. Series of Transactions for use in connection with Classes in Commercial Practice or Business Methods. Part I. The Home Trade. By F. Heelis, F.R.G.S., F.Inc.S.T., etc. This is merely an exercise book, but an exercise book of the right sort. Eight separate transactions, each typical of its kind, are dealt with. Each transaction is followed from its beginning to its conclusion, and every communication and business form or book entry is given in full, sometimes to the number of more than twenty. Six other transactions are given in outline only, for the pupil to work out in detail. The method is sound, and the selection of matter is admirable.

Pastors and Teachers: Six Lectures on Pastoral Theology. By the Right Rev. E. A. Knox, D.D., Bishop of Manchester, with an introduction by the Right Rev. Charles Gore, D.D., Bishop of Worcester. New and cheaper edition. This admirable series of lectures was reviewed in these columns on its first issue, and we are glad to see it appear now in a form which should ensure it a still wider circle of readers. We should have preferred to see the phrase "Pastoral Theology" abandoned for something more suggestive to the lay mind of the real topic of the book, which is not theology but education—religious education, no doubt, but still happily not theology. It is a book which should be widely read by pastors, teachers, and Sunday-school workers of all grades.

Object Lessons in Elementary Science. Stages I. and III. By Vincent T. Murché. Simplicity and completeness are the characteristics of these admirable aids to the teacher. The issue under review is a new and revised one.

Scott's **Woodstock, Ivanhoe,** and **Fortunes of Nigel.** Three volumes of a new edition of Scott's popular novels. They are well bound, and printed in a large, clear type. The editor's introduction to each volume is particularly good, and includes an outline of the novel, and well-drawn sketches of the chief characters. There are also numerous and useful notes on the text at the end of each book.

Spanish Commercial Practice connected with the Export and Import Trade to and from Spain, the Spanish Colonies, &c. By James Graham and Geo. A. S. Oliver. Part I. This book is one of the Hooper and Graham series of handbooks for the use of English students preparing themselves to act as foreign correspondents. The qualifications of the editors as teachers and business men are undoubted, and practically the whole of the matter contained in the books is taken from business letters and documents which have been used in actual foreign trade transactions. Each book is drawn up with a special view to the peculiarities of the language it illustrates, and of the methods of doing business in the countries where that language is spoken. From a careful review of the book we believe that it does all for the student which it claims to do. We are especially pleased to notice that the editors lay great stress on the absolute necessity of a study of the literature of the language. The reference to this point is worth quoting: "We strongly recommend students and business men, while studying this somewhat specialised course . . . to concurrently read and study the general language and literature of the country. We can assure them from experience that such study will greatly help them when meeting Frenchmen, Germans, or Spaniards, either socially or in business; also that, from an educational point of view, the general literary course is necessary to the successful negotiation of the technical commercial course." Had we our way, we would print advice like this in the largest of large print at the head of every manual of commercial correspondence.

An Introduction to the Calculus. By George A. Gibson, M.A. One of the latest developments in mathematical teaching is the introduction of graphs into the study of algebra. This is a recognition of the connection between algebra and geometry. But a curve or graph is not merely a method of representing facts which may be set out numerically, it should teach the student to recognise the fact that number, like a line, is continuous, and that minute changes in a line correspond with minute changes in the numerical measure of a quantity. The properties illustrated by means of graphs form the basis on which this introduction to the calculus is drawn up, and we heartily recommend all students who have studied the principles of "graphs" to work through this lucid book and get hold of the calculus, which they will soon regard as a useful tool in carrying on their mathematical work. The arrangement of the book is excellent, and we are pleased to see that integration is taken concurrently with differentiation.

Siepmann's Primary French Course. Part II. The importance of a good system in language teaching is greatest at the beginning, and we have already spoken in terms of the highest praise of Herr Siepmann's methods when dealing with Part I. This Part continues the work on the same lines and with the same thoroughness. The reading lessons form a most commendable feature; they deal with every-day topics in suitable terms, and are co-ordinate with grammatical drill and exercises in composition and conversation. Teachers who think Part I. too elementary may begin the course with this Part, as it is not really dependent on its predecessor.

"The Cup." By Lord Tennyson, edited by H. B. Cotterill, M.A. This play, which was mounted with such cost when produced by Sir Henry Irving, may be studied in some of the higher forms of secondary schools, and is suitable for literature classes in evening schools. The work of editing has been very successfully done, and students will find in the introduction and notes all they can desire to enable them to appreciate the play.

Milton's "Areopagitica." Edited by H. B. Cotterill, M.A. This prose work of Milton has been set for detailed study by candidates for the Certificate Examination next year, and to such, as well as to others who may take up this "speech," whether with or without an examination in view, we can strongly recommend this edition. The Introduction wisely limits biographical details to those events that bear on this particular book, and the notes are eminently suited to the needs of the ordinary English student who is not assumed to be steeped in Latin and Greek.

New Globe Readers, Books I. and II. These books are designed for teaching reading on the Syllabic Method, Book I. dealing with dissyllables that are regular in their notation, and Book II. with irregular dissyllables and regular trisyllables. The plan has been most carefully carried out, and considering how such a system must handicap a writer, the subject matter is interesting and intelligent. The illustrations are very attractive, being in most cases reproductions of photographs.

E. MARLBOROUGH AND CO., OLD BAILEY, LONDON.

Der Englische Dolmetscher is the title of the latest volume issued in Marlborough's useful "Self Taught Series." Although this volume is specially prepared to meet the requirements of Germans who wish to study the English language, it is none the less serviceable to English students for the purpose of comparison. It contains a large number of words in general use arranged under various headings; *e.g.* "The World and Nature," "Colours," "Seasons," "Town and Country," "Mankind," "The Human Body," "Dress," "Health," &c. &c. There are also special lists relating to "Legal," "Professional," "Commercial," "Shipping," and Travelling terms. The lists are arranged in parallel columns. With each German word is printed the article to show Gender, against which is printed the English equivalent, and the approximate pronunciation to assist Germans. The same arrangement is also followed in connection with the section dealing with selected lists of useful phrases and idiomatic expressions. Money tables are compared, and such useful subjects as "Photography" and "Cycling" come in for treatment in the Vocabulary and Phrase lists. The book also contains a brief Grammatical Summary (in German), followed by a few exercises in German and English. "Der Englische Dolmetscher" is a useful addition to this popular series of manuals for tourists and travellers.

HORACE MARSHALL AND SON, TEMPLE HOUSE, LONDON, E.C.

Selections from Prescott's History of Peru. Selections from Prescott's History of Mexico. Edited by A. S. Lamprey, B.A., Assistant Master at the Maidstone Grammar School. These two volumes of extracts from Prescott's great works are intended for school reading books. The extracts are well chosen, and are calculated to cultivate the literary tastes of young students, and to help them towards a clearer and more complete idea of the history of a period which is teeming with interest, and which has largely influenced the history both of America and Europe. The books are well got up and printed, and the illustrations are good.

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Stories from the Northern Sagas. The late Prof. F. York Powell, upon whose opinion on legendary and historical works we rely, was good enough to write the preface of the first edition of this book. His closing words were: "and so, without further parley, I commend this book to all gentle readers." This is exactly our opinion and we could not express it better. The stories are suitable for children and older readers.

Milton's Comus and Chaucer's Prologue. By C. T Onions, M.A. (Lond.). "The Carmelite Classics." This is an excellent series of pocket classics. Annotation has been reduced to a minimum, such assistance only being given as is absolutely necessary. A series of very suggestive questions on the text will have the effect of directing the student's thoughts while reading.

A Primer of General History. Part I. Ancient History. By W. H. Salter, B.A., LL.B. The style and general appearance of this book are greatly in its favour; the illustrations are very numerous, well chosen, and beautifully produced. The book differs from the usual school ancient histories; all the picturesque old legends are absolutely rejected, and this fact renders the book less suitable as an accompaniment to the study of classic literature. But, on the other hand, its history is very accurate, and brings before its readers the new light on ancient history which modern research has made possible. An outline of the history of ancient Egypt, Babylon, Assyria, and Phœnicia precedes the Greek and Roman periods.

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Test Questions in History. By Arthur T. Flux. The use of such a book as this will sometimes prevent the teacher from getting into a groove, and so the collection has a distinct utility. All the questions are from various public examinations—the King's Scholarship, Certificate, the Matriculation, Oxford and Cambridge Locals, and so on.

Composition for Schools and Colleges. By C. H. Maxwell, B.A. This is an excellent guide to the novice in essay writing. In addition to many very practical hints and cautions on general composition, a wide range of subjects is taken, and outline essays written thereon, enabling the student to see how a subject should be treated in a clear and logical manner.

Poetry Books—Nos. 1, 2, 3, and 4. The editor of these books has made a capital selection of pieces varying in style and form as much as could possibly be desired. The selections are in every way suitable for children, and inasmuch as they open up a new ground they ought to be very acceptable.

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The Pilgrim's Progress, the preface of which contains a biography of John Bunyan. In an appendix are printed the verses which appeared under the wood-blocks in the early editions.

The Meditations of Marcus Aurelius Antoninus. The text is from the English translation by Richard Graves, published in 1792.

Sense and Sensibility. Volume I. of Jane Austen's works.

The Essays and The New Atlantis, being the first volume of Bacon's English works.

Gibbon's Decline and Fall of the Roman Empire. This voluminous work will be issued in double volumes, the first of which closes with the reunion of the Empire under Constantine, A.D. 324.

The Works of William Shakespeare are to be published in ten volumes. Vol. I. includes *The Tempest*, *The Two Gentlemen of Verona*, *The Merry Wives of Windsor*, *Measure for Measure*, and *The Comedy of Errors*.

A Brief Survey of British History. By C. E. Snowden. The Survey "aims at presenting a clear and easily graspable analysis of the course of events to students who are reading, and at refreshing, at a minimum cost of time and trouble, the memories of those who have read." It consists of lists of the important events in each reign, with their dates, arranged in four parallel columns, under the headings Government, Parliament, Home, Foreign, of notes on the chief questions of each period, of genealogical tables, and of appendices "dealing with British relations with foreign nations, and giving information about other points of general interest not easily obtainable in a handy form." The book is well arranged, and covers in outline almost every phase of national life, from the Roman government of Britain, to the increased interest in sport and games of the later nineteenth century. The concise notes on constitutional developments, and the appendices dealing with the history of other countries, are particularly valuable. It is to be regretted that, owing to the method of compilation, references to authorities are very scanty; more references to events in foreign countries in the date column would also have been welcome. The book, however, should be useful to students and teachers as a framework for wider reading.

An English Church History for Children, A.D. 597–1066. By Mary E. Shipley. This book has picturesque touches, but the matter is sometimes complicated, though at times it is too simple for intelligent children of twelve, for whom it is obviously intended. Such a history is badly wanted, and probably a woman can handle the subject better than a man, but the present attempt, though commendable, hardly meets the need.

Repoussé Metal Work. By A. C. Horth. Mr. Horth has produced a useful and practical work on this interesting subject. The various processes are fully described, so that the student should understand all the technical difficulties. Repoussé work lends itself to very artistic treatment. The lack of this perhaps is the weak point of the book. For an elementary course, such as the book deals with, broad simple treatment of really beautiful forms would have been more suitable than the small detail suggested in several of the designs. The play of light and shade which results from good "modelling" is more important than wealth of detail.

Insect Life. Theobald. Thoroughly reliable for solid study. Mr. Theobald evidently understands the relation of plants to insect life. The concluding chapter deals with the preparation and application of insecticides, and should prove invaluable to farmer and amateur gardener alike.

JOHN MURRAY, 50A ALBEMARLE ST., LONDON, W.

Practical Science (2). By J. H. Leonard, B.Sc., and W. H. Salmon, B.A., B.Sc. This book is entitled "A Further Course of Practical Science," and has evidently been written to cover the ground required for the Oxford and Cambridge Local Examination. The course embraces mechanics, hydrostatics, and heat.

Many of the experiments are well selected, and the majority of them are of such a character that junior students will be able to understand them, but the book would have proved much more useful if more illustrations had been introduced. The section devoted to heat contains only one, and important instruments like the barometer, the air-pump, Attwood's machine, &c., are left without any pictorial description. The general appearance of the book is not such as to invite the attention of students.

Little Arthur's History of England. By Lady Calcott. This is a new edition of the well-known history which many of us used as children. This volume contains additional chapters which bring the information up to the end of Queen Victoria's reign. It is a book of convenient size, well illustrated, and written in that pleasant style which will make its young readers regard the study of their English history as a recreation.

The Intermediate French Reader. Edited by Maurice A. Gerothwohl. This is a well-chosen selection of readings from good French authors, arranged in two parts; the first including extracts relating to natural history, discoveries, and inventions, and the second part contains pieces referring to the History of France. The notes—historical, biographical, and grammatical—are very good. The book should prove most useful in schools, as the matter is interesting, and the pupils will gain an extensive vocabulary relating to common things.

Notes on Volumetric Analysis. By J. B. Russell, B.Sc. (Lond.) and A. H. Bell, B.Sc. (Vict.). This book is intended

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for use by students attending the laboratories of technical and secondary schools. The book as a whole is got up in an attractive style. It is clear in expression, and will be readily understood by comparatively young students. It suffers, however, from a paucity of diagrams, only four being introduced. A very serious omission we notice in the fact that nothing is said about the calibration of the burettes, pipettes, and flasks used for volumetric analysis. Every practical analyst knows how very important it is to check the graduations on measuring vessels. Very few are found to be correct, especially amongst the cheaper forms so very extensively used in secondary and technical schools.

A few minor defects might be pointed out in the instructions for several of the experiments. For instance, on p. 51 the student is told to allow a solution of ferrous sulphate to cool and then to make up to 250 cc. with distilled water before titration with potassium permanganate. It should be pointed out to the student that the water used for dilution should be previously freed from air by boiling, otherwise it will cause a certain amount of oxidation.

However, in the hands of a teacher who knows his subject the book will prove very useful. It is a distinct advance on many of the elementary practical chemistry books now in use.

The Life of Christ in the Words of the Gospel. By Joseph John Scott, M.A. This is a very valuable contribution to Gospel study. The incompleteness of the narrative arising from studying only one Gospel, the inconveniences of cross references in using a "harmony," and the neglect of the sacred text when a handbook is used, prove the need of such a volume as the present. The introduction and notes are extremely valuable helps.

Murray's History of England. M. A. Tucker. We consider this a highly satisfactory work. The paper, print, and binding are all that can be desired. The accessories comprise a list of important dates, all the necessary genealogical tables, a very full index, and a large number of well-executed maps. The body of the work also merits high praise. It is on the ordinary lines; but it is written in a good and pleasant style, and there is always evidence of a sense of proportion. The book is intended for boys and girls of thirteen or fourteen years of age, and they will do well to use it.

T. NELSON AND SONS.

Advanced Object Lessons in French. Book III. By Alex. Cran, M.A., Ph.D., D. ès Lettres. The first two books of this series have already secured a wide circulation in schools that favour the "direct method" of teaching French. The present volume is arranged on the same lines, and affords much useful material for conversation. The subjects are drawn principally from life in town, though the village is not forgotten, and they are treated with an air of reality which makes the language in which they are discussed something real and living also.

MESSRS. G. NEWNES, LTD., SOUTHAMPTON STREET, LONDON, W.C.

The Handy Atlas of the British Empire. By J. G. Bartholomew, F.G.R.S. Greater Britain beyond the seas is more than a hundred times larger than the Great Britain at home. This handy little atlas—it will slip easily into the pocket—is designed to give to the user of it some idea of the vastness of the dominions on which the sun never sets, over which King Edward rules. It is essential that every intelligent Briton should know the elements of the resources and wealth of the Empire, and understand the conditions of its strength and growth. This atlas, with its comparative tables, and succinct descriptive list of British Colonies and Possessions, is admirably fitted to give a more adequate knowledge of that portion of the world usually coloured red.

P. NOORDHOFF.

A Grammar of late Modern English, for the use of Continental, especially Dutch, Students. Part I., Section 1: The Elements of the Sentence. By H. Poutsma, English master in the Vierde Hoogere Burgerschool, met Driejarigen Cursus, Amsterdam. This work of nearly three hundred and fifty pages is a marvellous result of patient industry and research. Herr Poutsma, whose acquaintance with English literature in all its historical stages would put many an Englishman to shame, has set himself the task of comparing the literary English of the present day with that of earlier times, going right back to old Dan Chaucer himself. Not only has he investigated the nature of these changes, so far as they relate to literary expression in general, but he has applied his critical faculty to the investigation of the modifications of meaning which have arisen in the usage of particular words and phrases. The work is amply illustrated by quotations from latter-day authors, De Quincey being the most ancient author placed under contribution. Although intended primarily for Dutch students, the work is well worth reading by English students.

THE NORMAL PRESS, 110 AVONDALE SQUARE, LONDON, S.E.

1. The Normal Tudor Period. F. Horner, LL.B., B.A. The writer has evidently read widely on the period, and has written a useful book, whose value is increased by a chapter on constitutional history, and a number of biographical outlines. We think dates should have been introduced into the narrative more freely, but the chronological summary at the end partly remedies this defect.

2. Normal History of England, 1603-1688. J. Beith. This book contains a great deal of information, and the student will learn much from it. But there is need of revision to get rid of a number of faults. These consist of two or three misspelt words, several slips in English, and a few small inaccuracies as to facts. All these errors could easily be eradicated, and the book much improved thereby.

The Educational Ideas of Froebel and Pestalozzi. By J. H. Boardman, B.A. A rich treat for and a time-saver of the candidates for the Teachers' Certificate.

Twelfth Night. The student of *Twelfth Night* has in this edition everything at hand whereby he may quickly and thoroughly understand the play. The introduction, which deals with (*a*) the Rise and Fall of the English Drama, and (*b*) the Elizabethan Theatre, is an admirable adjunct to the book; the notes to the play itself are clear and scholarly; and the appendices contain a wealth of knowledge which no student can afford the time to search for in larger works.

Geographical Terms Explained. A book from which we have derived much pleasure and considerable profit. Many of the terms explained are such as cause bewilderment to a student in an examination room.

Paradise Lost. A complete paraphrase of Book VI.

The Normal Atlas of River Basins. The twenty-four maps which this book contains are all favourites with examiners, and therefore should be well studied. They are full without being unnecessarily crowded. If lines of latitude and longitude were included, the maps would be all the more serviceable.

Domestic Science and General Hygiene (Gardner and Young). Although this little volume contains nothing new, it justifies its appearance by the concise manner in which the matter has been arranged and the clearness with which the various points are brought out. The dotted line in the diagram on page 113 has been placed too high.

The Normal School Hygiene (Slefrig). This book contains a vast amount of useful and reliable information that would render it a valuable book of reference, but life is too short for a young student to adopt it as a text-book.

Advanced Arithmetic and Key. Part I. By Rev. J. Lightfoot, M.A., D.Sc. (The Normal Tutorial Series.) This work is not intended for beginners, but assumes the reader to have a general knowledge of elementary arithmetic. It commences with Notation, and includes in its pages sections on the four Simple Rules—Factors and Multiples, Fractions, Involution and Evolution, together with Mensuration and Graphic Arithmetic. Many of the worked examples, especially in the later sections, will be very helpful to students; but it seems hardly necessary to plot on squared paper the data of simple arithmetical or algebraical problems. These may be solved much more easily and expeditiously by the usual processes. There is a good selection of exercises. The key to these will be of great assistance to teachers or to those reading without the help of a teacher.

Milton's Sonnets. Parsed and analysed. In reviewing this book one's first feeling is one of considerable repugnance at this use of such a subject. No doubt such books have their use to country pupil teachers working for their examinations by their own efforts; we are sorry that it should be so.

The Normal Reprint of A.C.P. and L.C.P. **Questions on the Theory and Practice of Education.** The book contains only these questions; its use is sufficiently obvious to students preparing for these examinations.

Notes on Scott's Old Mortality. Clarke. A very useful little book to accompany the reading of the romance. Anno-

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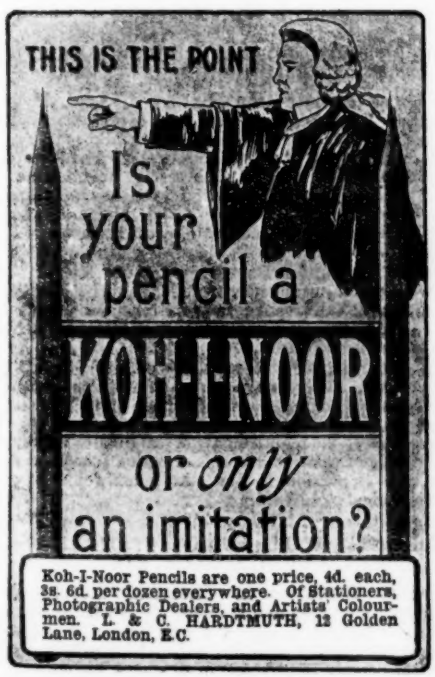

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Milton's L'Allegro and Il Penseroso. Edited by J. H. Boardman, B.A. The introduction is excellent; the matter is full and accurate, and its arrangement and classification make it much more helpful than such chapters usually are. The comparative analysis of the poems is something new and distinctly good; the notes on style are very thoughtful. One appendix deals with "Figures of Speech"; all these—Metonymy, Synecdoche, Hypallage, Oxymoron, &c.—are carefully explained and liberally illustrated from the two poems. There are many other excellent features.

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An Elementary Class-Book of Physical Geography. By William Hughes. This little book is too well known to require special recommendation. A new edition has afforded Mr. R. A. Gregory an opportunity of revising the work, and in its scope and substance he has effected considerable improvements. Though claiming to be but an outline of the subject, no student will fare badly who grasps all within its pages. The maps and diagrams are effective aids.

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The Local Examination History of England. Walker and Carter. The purpose of this book is presumably stated in the title. It will answer its purpose, but while containing some good features, it has several drawbacks. Thus the opening remarks at the beginning of each section are good, as are also some of the comparisons instituted. On the other hand, there is frequently a lack of definiteness, and this, in an elementary work, is a serious fault. Another defect is the absence of maps, plans, and genealogical tables.

Algebra for Junior Forms. By R. B. Morgan. On the whole we like the arrangement of the subject, but think it a pity to defer the full treatment of multiplication and division to so late in the book. The treatment of negative quantities and graphs is simple and clear.

Local Examination Geography of the World. By A. G. Haynes, M.A. There is a vast amount of information crammed into a very small compass, although much of it is but the bare bones of rational and useful geography. The work is specially prepared to meet the requirements of candidates for the Oxford and Cambridge Locals, and in this direction is perhaps as useful a book as it is possible to find. An index would have proved useful to students.

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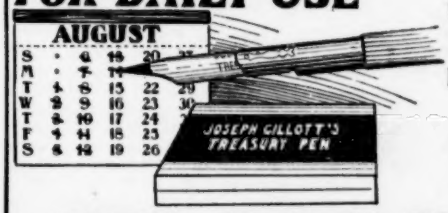

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in general. Part II. deals with Histology, and may be called a laboratory guide to such a text-book as Schäfer's Histology. In the absence of that copious illustration necessary for the correct identification and description of microscopic details, this section succeeds fairly well in instructing the student what to see and how to see it. The appendix to this Part will be found very useful in giving hints on staining, preparing, and mounting sections of tissues for the microscope. Very few printers' errors appear; on p. 16, Experiment 7, the name should be Adamkiewicz, and on p. 100 Ueffelman.

The Young Composer. By Dr. Cornwell. Forty-ninth edition, revised by Ben Jonson. A very useful book, containing a good deal of correct information on sentence forming, idioms, synonyms, figures of speech, essay writing, précis, and correspondence of various kinds. Its popularity will probably be increased by the careful revision to which it has been subjected.

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The Cruise of the "Cachalot." By Frank T. Bullen. This book gives a wonderfully interesting account of the pursuit of the sperm whale. Incidentally we are introduced to the various monsters of the deep, and to the excitement attending what was formerly one of our most important marine industries. As a prize-book for boys it will be hard to beat.

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Advanced French Composition. This book is not intended for the novice who is struggling with the accidence and rudiments of syntax, but after a discussion on those points of style in which French usage differs from our own, the student is furnished with a valuable collection of extracts for translation into French.

The Schoolmasters Year-Book. This valuable annual has reached its third issue, and we trust that this means that it has come to stay. The amount of information given is simply enormous, and in all points at which we have been able to test it we have found it accurate. There is a large amount of useful information about each of the various educational societies, and full description of the standard examinations for which teachers either prepare their pupils or enter themselves. An account is given of the Universities and other places of higher education, and the Chronicle of the Year deals with all important educational matters that have taken place during the year, from the Parliamentary debates to the publication of school books. A large section of the book is taken up with the "Schoolmasters Directory," and until we get an official Register containing the name of every qualified teacher such a list is an absolute necessity.

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Selections from Latin Authors. Watt and Hayes. Certificate edition. We know of no better selection than this, which is nearly identical with the "Matriculation Selections." Characteristic and interesting pieces in the best style of all the greatest writers are collected together, with notes in explanation. There is also a time-saving lexicon. An excellent feature is the sixty-page introduction, treating briefly of Roman life, history, religion, literature, and so forth. At the end are the passages for translation from previous Certificate examinations.

Our Mother Tongue. By Hewitt and Beach. The publishers have issued a new edition of this well-known and useful book. Teachers will find this an excellent general grammar, wider in its range than the majority, and dealing with many aspects of the teaching of English not generally included in grammar text-books.

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How to Become a Teacher. By T. W. Berry. In the present dearth of teachers, Mr. Berry's little book may be of considerable use in inducing suitable candidates to join the profession. All the various regulations affecting entrance to the ranks, the various classes of teachers, registration, etc., superannuation, with full information as to the various training colleges and teaching diplomas, are collected and arranged so simply that any one can understand the preparation necessary, and the probable ultimate reward. We trust the book will do something to induce suitable candidates to come forward, so that education authorities will not have need to go to the hedgerows and byways, as at present.

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Wild Flowers Month by Month in their Natural Haunts. By Edward Step, F.L.S., author of *Wayside and Woodland Blossoms, etc.* Vol. I. With 166 illustrations reproduced from original photographs by the author.

We have often been told of late that we cannot study "Nature Knowledge" from books. This is true, but it is equally true that we cannot study it *without* books. Life is too short for any one man, even if a genius, to tackle any realm of knowledge *de novo* with the most distant hope of success; and in the knowledge of nature as well as in other departments of human knowledge we climb by standing on the shoulders of those who have preceded us. Mr. Step is not yet one of the ancients, but he has gone before most men in his own special study, and his services to those who would follow him are almost unique in their way. Many of his publications are already familiar to teachers and to students, and are valued highly for the simplicity and lucidity of their treatment, and for the practical use which may be made of them in opening the eyes of those who have been practically "born blind" to the wonders of plant life. In the book now before us our author has easily beaten his own record, while his publishers have seconded him with the perfection of their issue of the book. "Month by Month" is the best interval to choose for a review of the plant life of the year. It avoids the repetition which shorter periods would involve, while it is yet short enough to enable the working student to keep his head fairly clear even amid the rush of new species which appear in the late spring and early summer. The skill of the practical hand is further seen in the subdivisions of each month; each chapter deals with a distinct region—the woods, the chalk-hills, the common, the lanes, the riverside, the seashore, and the like. This arrangement is admirable, and nothing could better serve the purposes either of a teacher in planning out the walk or excursion of his class, or of the private student or lay person who has definitely made up his mind to "consider the lilies."

We have yet to mention a feature which is perhaps *the* feature of the book—the wonderful series of plant photographs which it contains. We have already seen some attempts, and successful attempts, to photograph growing plants in their natural surroundings, and we felt that this was really a new factor in plant study for the young, but Mr. Step's photographs go far beyond anything which has come under our notice. The difficulties of taking such photographs are enormous. The vagaries in which the camera indulges where bright colours are in question are familiar to every amateur. The experienced practitioner can surmount these, but only by methods which require comparatively long exposures, and long exposures often spell failure when the subject is the slender swaying stems and nodding heads of our wild flowers. How Mr. Step has managed to circumvent all hostile influences will be most appreciated by those who have some familiarity with the camera and also with flowers, but no technical knowledge of either is required to enable one to appreciate the beauty and the faithfulness of his results. In this respect the book is a masterpiece, and even the author will find it hard to surpass what he has now done. It is difficult to see how the book could be improved in most of its aspects; but in one point we venture to suggest that Mr. Step could make it yet more educative and helpful to the unskilled reader, and that is by adding to the photograph of the plant a *drawing* of it, which would bring out clearly the points essential to its identification. We believe that such a feature would materially help those whose knowledge of botany is of a slender type.

We heartily commend this work to teachers. The fine open-air tone of the chapters represent what should be aimed at in all nature teaching, while the minutely accurate and first-hand knowledge of the writer make him a thoroughly reliable guide. We mean to read the summer chapters during the dead of next winter, when the landscape is buried in snow; the next best thing to the actual stroll through the shady lanes or along the breezy seashore is the "personally conducted" tour now before us, with the charm of the picture added to the vivid word-painting of the writer.

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